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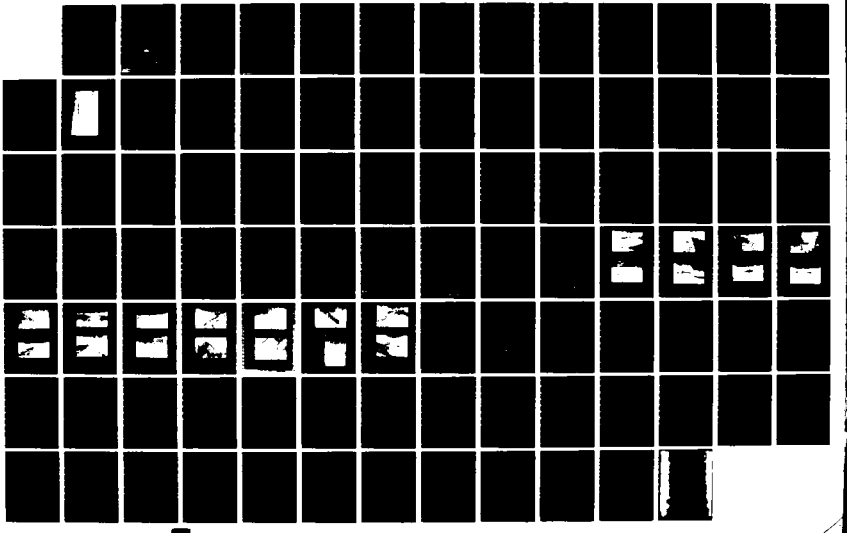

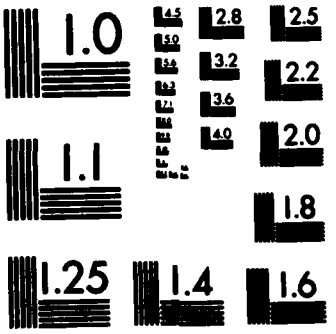

HOUSATONIC RIVER BASIN
STRATFORD, CONNECTICUT

BEAVER DAM LAKE DAM
CT 00083

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

MAY 1979

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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Houatonic River Dam
Stratford, Conn.
Beaver Dam Lake

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Beaver Dam Lake Dam is a 1300 ft. long earth embankment dam and has a maximum height of 47.3 ft. The top width of the dam is 16 ft. The spillway is located on the left side of the embankment. It appears that the original earth embankment dam which was approx. 20 ft. in height was raised 27 ft. to its present height.The test flood is equal to Probable Maximum Flood. The spillway will pass the test flood outflow of 1225 cfs with a pool elevation of 176.15 ft. which is 1.65 ft. below the top of the dam.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

OCT 15 1979

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Beaver Dam Lake Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Beaver Dam Lake Association, Beaver Dam Road, Stratford, Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

BEAVER DAM LAKE DAM

CT 00083

HOUSATONIC RIVER BASIN
FAIRFIELD, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LETTER OF TRANSMITTAL

FROM THE CORPS OF ENGINEERS TO THE STATE

TO BE SUPPLIED BY THE CORPS OF ENGINEERS

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT

Identification No.: CT 00083

Name of Dam: Beaver Dam Lake Dam

Town: Stratford

County and State: Fairfield, Connecticut

Stream: Pumpkin Ground Brook

Date of Inspection: November 20, 1978, and December 29, 1978

Beaver Dam Lake Dam is a 1300 foot long earth embankment dam and has a maximum height of 47.3 feet. The top width of the dam is 16 feet. The spillway is located on the left side of the embankment. It appears that the original earth embankment dam which was approximately 20 feet in height was raised 27 feet to its present height.

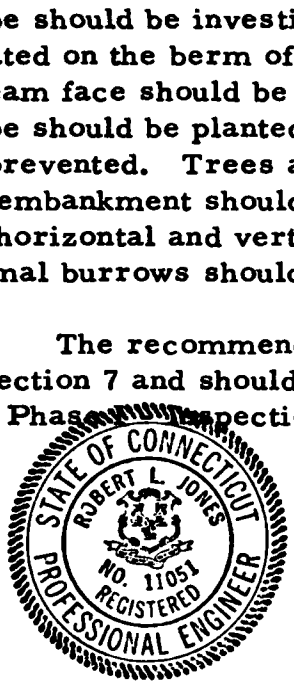
Engineering data available consisted of one drawing dated October, 1900 showing cross-section of the dam through the gate chamber. This drawing is questionable in accuracy of details. No construction specifications or design calculations were available.

The visual inspection of Beaver Dam Lake Dam indicated that the dam is in fair condition. The inspection revealed the existence of a foot path along the entire crest of the dam. The right 800 foot long portion of the dam shows the crest of the dam to be sloping toward the reservoir (upstream) by as much as 12 inches. Riprap in some areas of the upstream slope of the embankment has been eroded. The upstream gatehouse foundation has separated from the gate chamber wall by as much as 3 inches and this crevice extends to a depth of 5 feet below ground surface. An extensive growth of grass, briars, rosebushes and brush cover the upper downstream slope of the embankment. The lower slope is covered with grass, brush and many trees. Also, numerous animal holes up to 12 inches in diameter were observed on the downstream face of the dam.

Based on its intermediate size and high hazard classification and in accordance with the Corps guidelines, the test flood is equal to Probable Maximum Flood. The spillway will pass the test flood outflow of 1225 cfs with a pool elevation of 176.15 feet which is 1.65 feet below the top of the dam.

Based on the findings of the visual inspection and hydrologic and hydraulic analysis, there is need for further engineering studies. Provisions should be made by the owner to retain the services of a professional engineer to investigate the possibility of seepage along the toe of the lower downstream slope to determine if seepage control measures are required. The possibility of movement of the upstream slope should be investigated. The owner should also remove all trees located on the berm of the lower downstream slope. Riprap on the upstream face should be repaired. Proper vegetation on the downstream slope should be planted and maintained. Trespassing on the dam should be prevented. Trees and brush within 30 feet of the downstream toe of the embankment should be permanently removed. A monitoring system for horizontal and vertical movement of the crest should be installed. Animal burrows should be back filled on a regular basis.

The recommendations and remedial measures are described in Section 7 and should be addressed within one year after receipt of this Phase I Inspection Report by the owner.



Robert L. Jones, P.E.
Project Manager

Philip W. Genovese & Associates, Inc.
Hamden, Connecticut

This Phase I Inspection Report on Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

THIS SHEET TO BE FURNISHED BY THE CORPS OF ENGINEERS

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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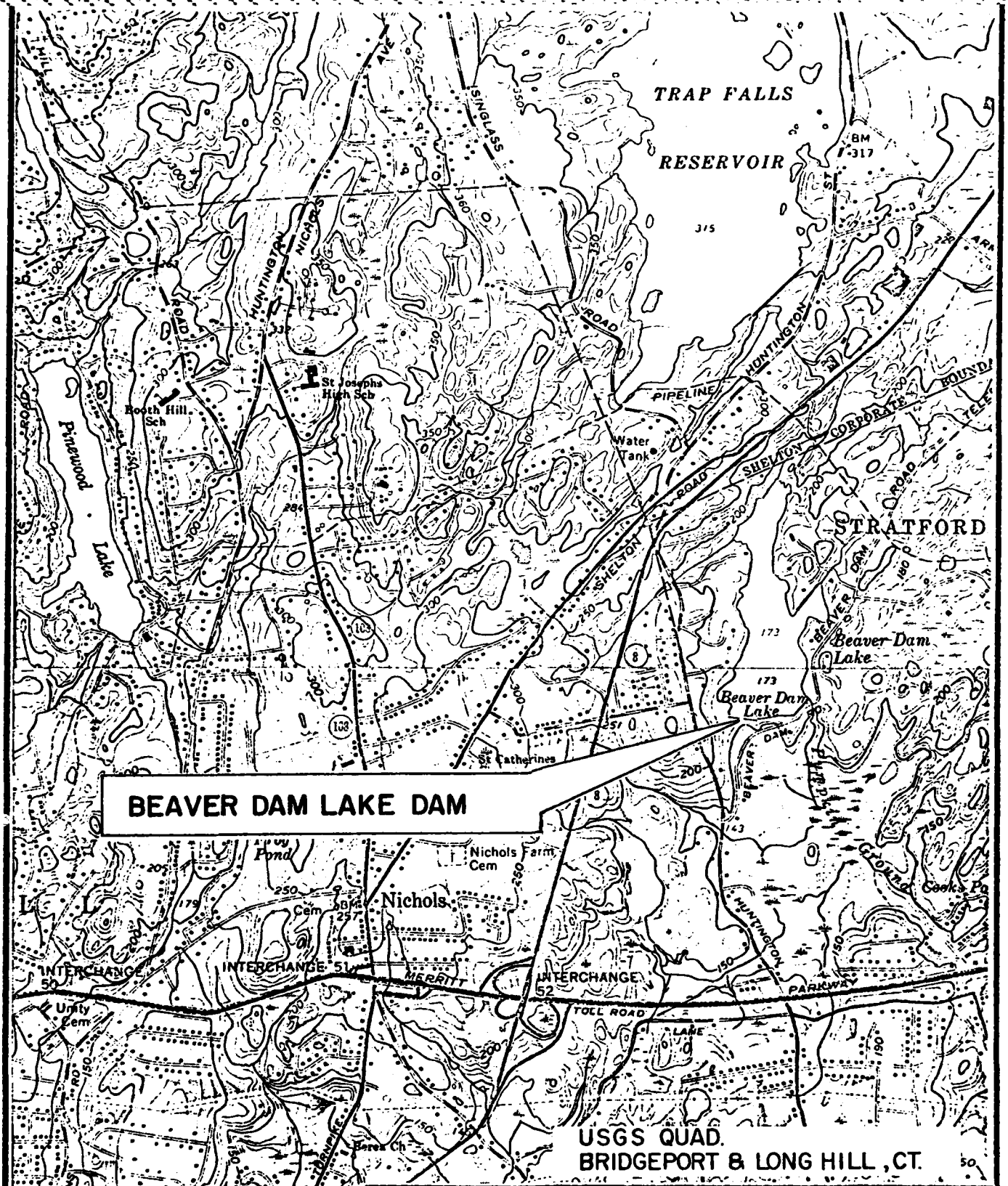
PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS-HAMDEN, CT.		



PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS-HAMDEN, CT.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LOCATION MAP

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Philip W. Genovese and Associates, Inc., has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Philip W. Genovese and Associates, Inc., under a letter of November 28, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-79-C0019 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Beaver Dam Lake Dam is located on Pumpkin Ground Brook in the Town of Stratford, Connecticut. The dam is approximately one mile downstream from Trap Falls Reservoir. It is about 4000 feet upstream of the Merrit Parkway (Conn. Route 15). The dam is shown on the USGS Quadrangle,Bridgeport, Connecticut with coordinates approximately N 41° 14.8', W 73° 08.5', Fairfield County, Connecticut. The location of the dam is shown on the Location Map immediately preceding this page.

b. Description of Dam and Appurtenances

Beaver Dam Lake Dam consists of an earthen embankment

section that is approximately 1300 feet in length. The spillway section has an effective length of 73 feet and is on the left side of the embankment.

The maximum structural height is 47.3 feet.

Appurtenant structures consist of a large stone spillway, spillway channel and outlet works structures. The spillway section consists of a 73 feet wide broad crested weir with crest elevation of 173 feet.

The outlet works consist of one abandoned gatehouse for the former dam and sealed gate chamber house on the upstream side of the present dam.

Figure 1, located in Appendix B shows the plan of the dam and its appurtenant structures. Photographs of each structure are shown in Appendix C. Sketches of the dam and its appurtenances are in Appendix D.

d. Size Classifications. Intermediate (hydraulic height - 47.3 feet high, storage 1216 acre-feet) based on height and storage ($\geq$1,000 to 50,000 acre-feet and $\geq$40 and $<$100 feet) as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. The dam's potential for damage rates it as a high hazard classification. A major breach could result in discharge into Pumpkin Ground Brook which flows about three miles through suburban Stratford before reaching the Housatonic River.

Immediately downstream of the dam for approximately 3000 feet in length and 2000 feet in width is a low-lying, flat swamp area. Approximately 30 houses are located around the swamp where flooding depths could range from 10 to 20 feet. About 4000 feet below the dam is Cook's Pond which has approximately 25 houses around the pond. Other development is located near Pumpkin Ground Brook and includes Merritt Parkway.

e. Ownership. The dam is owned by Beaver Dam Lake Association, Mr. John E. Tierney, President, Phone (203) 377-1016, Beaver Dam Road, Stratford, Connecticut 06497.

f. Operator. Mr. Fritz Mauer

g. Purpose of Dam. Recreation

h. Design and Construction History. There is no positive information regarding the origin of the dam. A drawing was found with a date 1900. However, this drawing does not agree with existing conditions. It is believed that the original dam was a very low dam that was raised to its present elevation in 1911. In 1933 the present owner purchased the dam from the Bridgeport Hydraulic Company.

i. Normal Operating Procedure. None

1.3 Pertinent Data

a. Drainage Area. The drainage area tributary to Beaver Dam Lake Dam consists of approximately 2.25 square miles flat and coastal terrain. In addition to the reservoir, 50 percent of the basin is made up of lake and swamp area. Elevations in the basin range from about 175 feet to 400 feet MSL.

Upstream of Beaver Lake is Trap Falls Reservoir which is a water supply reservoir with 1.08 square miles of drainage area that is included in the total drainage area of Beaver Dam Lake drainage area. Fifty percent of the Trap Falls drainage area is the Trap Falls Reservoir water surface.

The reservoir consists of about 57 acres at the normal (top of spillway) pool elevation. Some dwellings are located along the reservoir shores.

b. Discharge at Dam Site

(1) No outlet works for the dam exists that is in working condition. See plan in Appendix B and sketches in Appendix D.

(2) There are no records of maximum discharge at the dam.

(3) The spillway capacity with a water surface at the top of dam elevation (177.8') would be approximately 2300 cfs..

(4) The total project discharge at the test flood elevation of 176.15 feet is 1225 cfs.

c. Elevation (feet above MSL)

(1) Streambed at centerline of dam - 130.5

(2) Maximum tailwater - N/A

(3) Upstream portal invert diversion tunnel - N/A

(4) Recreation pool - 173.0

(5) Full flood control pool - N/A

(6) Spillway crest (permanent spillway)- 173.0

(7) Design surcharge - unknown

(8) Top dam - 177.8

(9) Test flood surcharge - 176.15

d. Reservoir (miles)

(1) Length of maximum pool - 0.66

(2) Length of recreational pool - 0.66

(3) Length of flood control pool - N/A

e. Gross Storage (acre-feet)

(1) Recreation pool - 898

(2) Flood control pool - N/A

(3) Spillway crest pool - 898

(4) Top of dam - 1216

f. Reservoir Surface (acres)

(1) Recreation pool - 57

(2) Flood control pool - N/A

(3) Spillway crest - 57

(4) Test flood pool - 65

(5) Top dam - 69

g. Dam

(1) Type - Earthen

(2) Length - 1300 feet

(3) Height - 47.3 feet

(4) Top width - 16 feet

(5) Side slopes - Upstream: 3:1
Downstream: 1.5:1

Downstream:

(6) Zoning - unknown

(7) Impervious core - unknown

(8) Cutoff- unknown

(9) Grout curtain - unknown

(10) Other - unknown

h. Diversion and Regulating Tunnel - None

i. Spillway

(1) Type - Broad crested

(2) Length of weir - 73 feet

(3) Crest elevation - 173 feet

(4) Gates - None

(5) Upstream channel - None visible

(6) Downstream channel - Large stone masonry

j. Regulating Outlets. The reservoir cannot be drained. The gate house is sealed and reported to be inoperable.

SECTION 2
ENGINEERING DATA

2.1 Design

No design drawings were found of this dam. Prior to the present ownership, the dam belonged to the Bridgeport Hydraulic Company. However, the files contained no plans other than a drawing dated 1900 showing a cross section through the dam and gate chamber. This drawing does not agree with existing conditions and is not considered to be reliable. According to the present owner, the existing dam was constructed on an older dam in 1911 which was incorporated into the downstream toe. The Beaver Dam Association purchased the present dam from Bridgeport Hydraulic Company in 1933. No in-depth engineering data were found for this dam.

2.2 Construction

No construction records were available for use in evaluating the dam.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. No reliable engineering data was found to be available.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity. The lack of engineering plans eliminates a judgment of validity.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Beaver Dam Lake Dam was made on November 20, 1978. The inspection team consisted of personnel from Philip W. Genovese & Associates, Inc. and Geotechnical Engineers, Inc. A representative of the Beaver Dam Association, Mr. Fritz Mauer was also present during portions of the inspection. Inspection checklists, completed during the visual inspection are included in Appendix A. At the time of the inspection, the water level was approximately 0.07 feet above the permanent spillway elevation and water was passing over the spillway. The upstream face of the dam could only be inspected above this water level.

b. Dam. The dam consists of an earthen embankment about 1300 feet long and the crest is at elevation 177.8 feet.

Crest

The crest of the dam is covered with grass and there is a worn footpath along the entire length of the crest. From approximately Station 5+0 to Station 13+0, the upstream portion of the dam crest is sloping toward the reservoir. The vertical displacement between the upstream edge of the crest and the centerline varies between 6 inches and 12 inches in height. In the absence of any design drawings or documentation, it is not possible to determine whether the dam crest was constructed with an upstream slope or it was the result of previous movement along the upstream face toward the reservoir. No longitudinal cracks were observed along the crest of the dam at the time of the inspection.

Upstream Face

The upstream face is mostly covered with riprap to within 1 to 2 feet of the crest. In some locations the riprap is absent or has been displaced by erosion and the upstream slope is partially covered with grass. At Station 7+20, there is an upstream gatehouse which is located on the upstream slope. A cut masonry block wall was observed below the soil cover for a short distance in the vicinity of the upstream gatehouse. A 3-inch separation has developed between the foundation of the gatehouse and the cut masonry block wall. This crevice extends to a depth of 5 feet below the surface of the ground. Standing water could be observed at this depth.

Downstream Face

The downstream face is comprised of an upper and lower slope which is separated by a 15 foot wide berm between Station 4+0 and Station 13+55. The berm is reported to be the crest of the previous dam which existed prior to the raising of the reservoir. The upper slope is covered with an extensive growth of grass, briars, rose bushes, and brush which made it very difficult to traverse the slope. No standing water or seepage was observed at the toe of the upper slope. The lower slope is covered with grass, brush, and many large and small trees. No standing water or seepage was observed at the toe of the lower slope. This area is heavily vegetated and seepage could be present at the toe which could be obscured by the dense growth.

Numerous small animal holes up to 12 inches in diameter were seen on the downstream face. Several of the animal hole locations had been marked with cans, as indicated in the foreground of Photo 18.

c. Appurtenant Structures. Visual inspection of the spillway and spillway channel did not reveal any evidence of stability problems. The cut masonry block surface appeared to be in good condition.

The spillway structure is shown in Photos 1 and 2. It consists of cement rubble masonry training walls and a weir of cut block masonry. Flash board pins are anchored into the spillway crest and extend upward 8 to 10 inches in height as seen in Photo 6.

The outlet works is sealed shut and reported to be non-functioning. There is an upstream gatehouse and an abandoned downstream gatehouse which is reported to be the gatehouse for the former low dam. Plans indicate 30 inch intake and outlet pipes to the chamber. A 12 inch blow-off pipe is also shown on the plans. All pipes are gated.

The spillway discharge channel is bedrock and has numerous trees growing from the channel floor.

d. Reservoir Area. The reservoir area has flat and coastal terrain, partially wood covered. A more detailed description of the drainage area is included in Section 1.3 of this report. There was some development observed along the shoreline.

e. Downstream Channel. The downstream channel has numerous trees growing from the bedrock floor and some loose blocks of rock on the floor.

3.2 Evaluation

Visual examination indicates that the dam is in fair condition. Trespassing has led to the development of a path along the crest of the dam which could promote erosion of the embankment. There is an extensive growth of brush and trees on the downstream slope. Seepage may be present near the toe of the lower slope, but observations were obscured by the extensive undergrowth in this area. Displacement of the crest could be the result of movement of the embankment toward the reservoir.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure

The dam creates an impoundment of the water which is used primarily for recreational purposes.

4.2 Maintenance of Dam

There is no regular maintenance program for the dam.

4.3 Maintenance of Operating Facilities

Maintenance of operating facilities is not done.

4.4 Description of Warning Systems

There are no warning systems in effect at this facility.

4.5 Evaluation

There is no current operating and maintenance procedure for the dam.

SECTION 5
HYDROLOGY AND HYDRAULIC ANALYSIS

5.1 Evaluation of Features

Beaver Dam Lake Dam consists of a 1300 foot long earthen embankment with a spillway of cut masonry block and cement rubble masonry with an effective length of 73 feet. There are no functioning appurtenances other than the spillway. The spillway crest is at elevation 173.0 feet and is located on the extreme left side of the embankment.

Beaver Dam Lake Dam is classified as being intermediate in size with a maximum storage of 1216 acre-feet.

Beaver Dam Lake watershed area of 2.85 square miles includes Trap Falls Reservoir watershed area of 1.08 square miles. Fifty percent of the Trap Falls watershed is the reservoir water surface. The attenuating effect of Trap Falls Reservoir was considered when selecting the test flood.

a. Design Data. No hydrologic or hydraulic design data were disclosed for this dam.

b. Experience Data. The maximum discharge at this dam site is unknown.

c. Visual Observations. No evidence of damage to any portion of the project from overtopping was visible at the time of the inspection.

d. Test Flood Analysis. As no detailed design and operational information are available, hydrologic evaluation was performed using dam information gathered by field inspection, watershed size and an estimated test flood equal to the Probable Maximum Flood (PMF) as determined by guide curves issued by the Corps of Engineers. Based on a drainage area of 2.25 square miles, it was estimated that the test flood inflow at this dam would be 1350 cfs. Following the guidance for Estimating Effect of Surcharge Storage on Maximum Probable Discharges results in a test flood discharge of 1225 cfs. As the maximum spillway capacity at the top of the dam is 2250 cfs the spillway will pass the PMF without overtopping the dam.

f. Dam Failure Analysis. The impact of failure of the dam at maximum pool (top of dam) was assessed using the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers.

A major breach of dam would result in a flood wave at least 17 feet high for a distance of 3400 feet downstream of the dam.

Also, Cooks Pond with its area of approximately 4 acres and having 25 houses located at the waters edge is 4200 feet downstream of the dam and subject to flooding.

Downstream discharges and flood stages for various distances that probably would result from a major breach are as follows:

Downstream Reach (in feet downstream of dam)	Discharge (cfs)	Flood Stage (Feet)
Before breach	1,225	
Breached	109,390	
800	83,170	13.4
2100	45,270	9.4
2700	32,490	9.6
3400	24,130	17.5

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The visual examination did not disclose any immediate stability problems. The vertical displacement between the upstream edge of the crest and the centerline varies between 6 inches and 12 inches. In the absence of any design drawings or documentation, it is not possible to determine whether the dam crest was constructed with an upstream slope, or it was the results of previous movement along the upstream face toward the reservoir.

b. Design and Construction Data. There is no reliable information about the design and construction of this dam.

c. Operating Records. No operating records pertinent to the structural stability of the dam were available.

d. Post Construction Changes. There is no available reliable information about post-construction change.

e. Seismic Stability. The dam is located in Seismic Zone 1, and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual inspection indicates that Beaver Dam Lake Dam is in fair condition. The major concerns regarding the long-term performance of the dam are:

1) Existence of possible seepage areas along the downstream toe of the dam which are undetected due to the extensive undergrowth, vines and trees in this area and which, for the same reason, would be undetected in the future.

2) Existence of a substantial slope of the upstream crest of the dam toward the reservoir.

3) Existence of animal burrows on the upstream face of the dam.

4) The lack of an operable outlet for the reservoir.

b. Adequacy of Information. The lack of any engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Urgency. This dam is in fair condition. The recommendations and remedial measures described in Section 7.2 and 7.3 should be accomplished within one year after receipt of this Phase I Inspection Report by the owner.

d. Need for Additional Investigation. No observations indicate that Beaver Dam Lake Dam requires a comprehensive investigation at this time. However, the recommendations and remedial measures outlined in 7.2 and 7.3 will require some additional engineering input and analysis.

7.2 Recommendations. Based on the findings of the visual inspection and hydrologic and hydraulic analysis, there is no need for comprehensive engineering studies or for major alterations to the dam. However, some of the recommendations and remedial measures will require engineering input, analysis and design.

It is recommended that the owner should retain the services of a professional engineer to investigate the possibility of seepage along the toe of the lower downstream slope and to determine what type of seepage control measures are required, if any. In addition, the possibility of movement of the upstream slope should be investigated.

Survey monuments along the crest of the dam should be installed and horizontal and vertical movements should be monitored.

7.3 Remedial Measures

a. All trees on the berm and the lower downstream slope should be removed under the supervision of a professional engineer.

b. Riprap of the upstream face of the dam should be repaired.

c. Proper vegetation of the downstream slope of the dam should be maintained.

d. Trespassing on the crest and slopes of the dam should be prevented.

e. All trees and brush within 30 feet downstream of the toe of the embankment should be cleared and maintained in this condition.

f. Animal holes in the embankment should be backfilled on a regular basis.

g. An operational procedure and formal warning system for emergency conditions should be established.

h. An annual technical inspection program should be developed.

i. Flash board pins located on the crest of the spillway should be removed.

7.4 Alternatives. There are no practical alternatives to the recommendations in Section 7.2 and 7.3.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Beaver Dam Lake Dam

DATE 11/20/78

TIME 1000

WEATHER Sunny 50°F

W.S. ELEV. 173 assumed U.S. ____ DN.S.

PARTY

1. Bob Jones Party Chief
2. Dick Murdock Geotechnical
3. Don Ballou Hydraulics/Hydrology
4. Fritz Mauer Association Representative

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/78

PROJECT FEATURE Earthen Dam Embankment NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	DAM EMBANKMENT	
	Crest Elevation	178
	Current Pool Elevation	173
	Maximum Impoundment to Date	
GEI	Surface Cracks	None apparent
GEI	Pavement Condition	Not paved, grass, some erosion due to traffic
GEI	Movement or Settlement of Crest	Evidence of past movement of crest toward reservoir
GEI	Lateral Movement	Suggestion of pave movement of the crest
GEI	Vertical Alignment	Good
GEI	Horizontal Alignment	Good
GEI	Condition at Abutment and at Concrete Structures	Good
GEI	Indications of Movement of Structural Items on Slopes	Approximately 3" of movement of gate house toward reservoir
GEI	Trespassing on Slopes	Extensive vegetation, animal burrows present
GEI	Sloughing or Erosion of Slopes or Abutments	None apparent
GEI	Rock Slope Protection- Riprap Failures	Good
GEI	Unusual Movement or Cracking at or Near Toe	None
GEI	Unusual Embankment or Downstream Seepage	None
GEI	Piping or Boils	None
GEI	Foundation Drainage Features	None
GEI	Toe Drains	None
GEI	Instrumentation System	None
GEI	Vegetation	Very extensive on the downstream slope

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/78

PROJECT FEATURE Other Embankment NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	DIKE EMBANKMENT	
	Crest Elevation	N. A.
	Current Pool Elevation	
	Maximum Impoundment to Date	
EI	Surface Cracks	
GEI	Pavement Condition	
EI	Movement or Settlement of Crest	
GEI	Lateral Movement	
EI	Vertical Alignment	
GEI	Horizontal Alignment	
GEI	Condition at Abutment and at Concrete Structures	
EI	Indications of Movement of Structural Items on Slopes	
EI	Trespassing on Slopes	
GEI	Sloughing or Erosion of Slopes or Abutments	
GEI	Rock Slope Protection- Riprap Failures	
EI	Unusual Movement or Cracking at or Near Toes	
EI	Unusual Embankment or Downstream Seepage	
GEI	Piping or Boils	
GEI	Foundation Drainage Features	
EI	Toe Drains	
GEI	Instrumentation System	
EI	Vegetation	

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/78

PROJECT FEATURE Outlet Works - Intake NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Underwater, not observed
GEI Slope Conditions	
GEI Bottom Conditions	
GEI Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
GEI Drains or Weep Holes	
b. Intake Structure	None observed
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/78

PROJECT FEATURE Outworks Control Tower NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	N. A.
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/79

PROJECT FEATURE Outlet Works - Transition NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	N.A.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/78

PROJECT FEATURE Outlet Works - Channel NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	N.A.
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
EI Drain holes	
GEI Channel	
EI Loose Rock or Trees Overhanging Channel	
EI Condition of Discharge Channel	

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/79

PROJECT FEATURE Outlet Works - Spillway NAME

DISCIPLINE NAME

	AREA EVALUATED	CONDITION
	OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
	a. Approach Channel	
EI	General Condition	Underwater
GEI	Loose Rock Overhanging Channel	None
GEI	Trees Overhanging Channel	None
EI	Floor or Approach Channel	Underwater, riprap on natural stone
	b. Weir and Training Walls	Flash board pins (rebars) attached to weir crest
	General Condition of Concrete	Masonry cut stone weir
	Rust or Staining	None
	Spalling	None
	Any Visible Reinforcing	None
	Any Seepage or Efflorescence	Some evidence along west training wall
EI	Drain Holes	None
	c. Discharge Channel	
GEI	General Condition	Considerable overgrowth and small trees
GEI	Loose Rock Overhanging Channel	None
EI	Floor of Channel	Partly bedrock and loose rock
EI	Other Obstructions	Tree growth in bottom of channel

PERIODIC INSPECTION CHECKLIST

PROJECT: Beaver Dam Lake Dam DATE 11/20/79

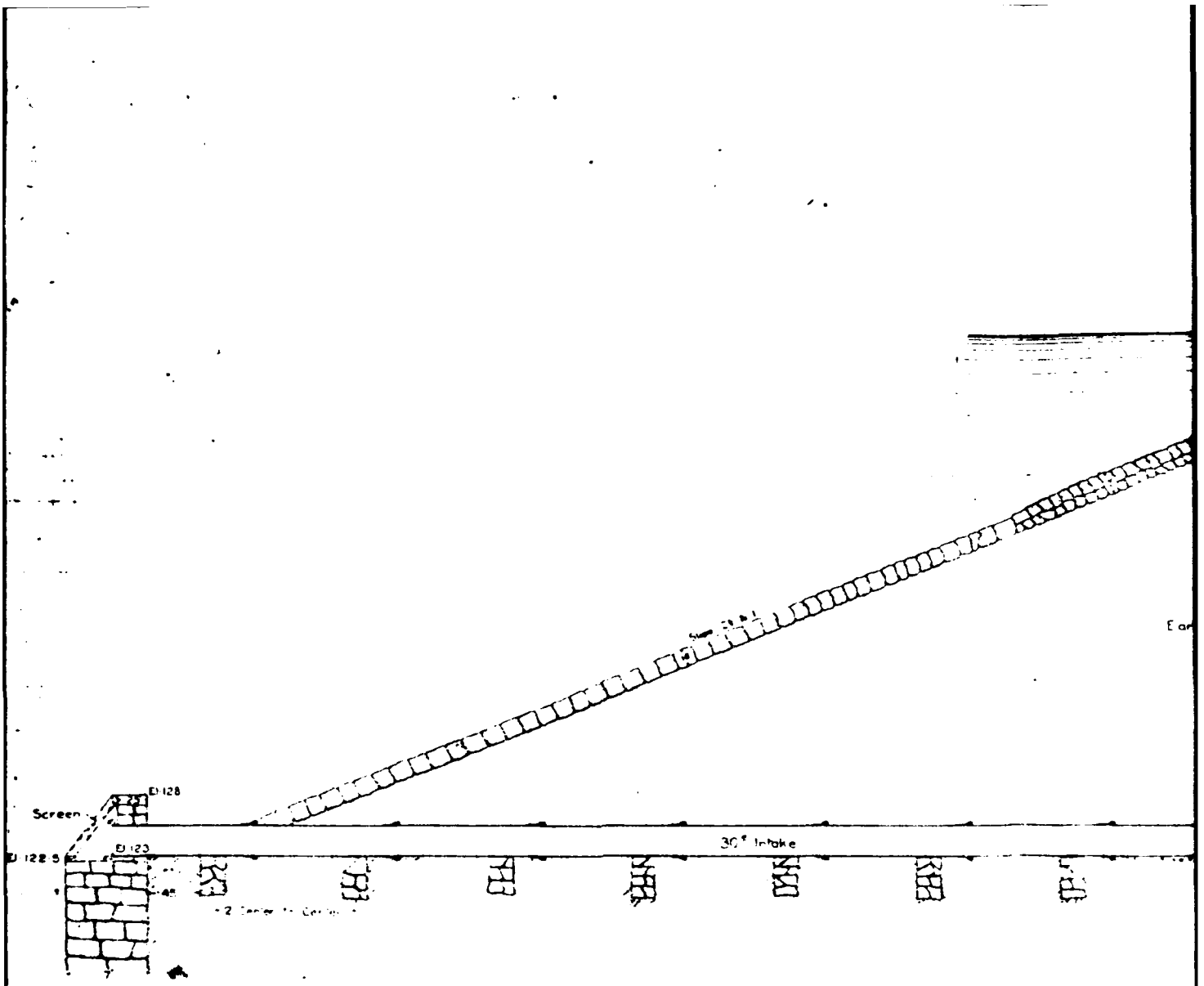
PROJECT FEATURE Outlet Works-Service Bridge NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS -SERVICE BRIDGE	
a. Super Structure	N.A.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

ENGINEERING DATA



BEAVER DAM-

STRATFORD CONN-

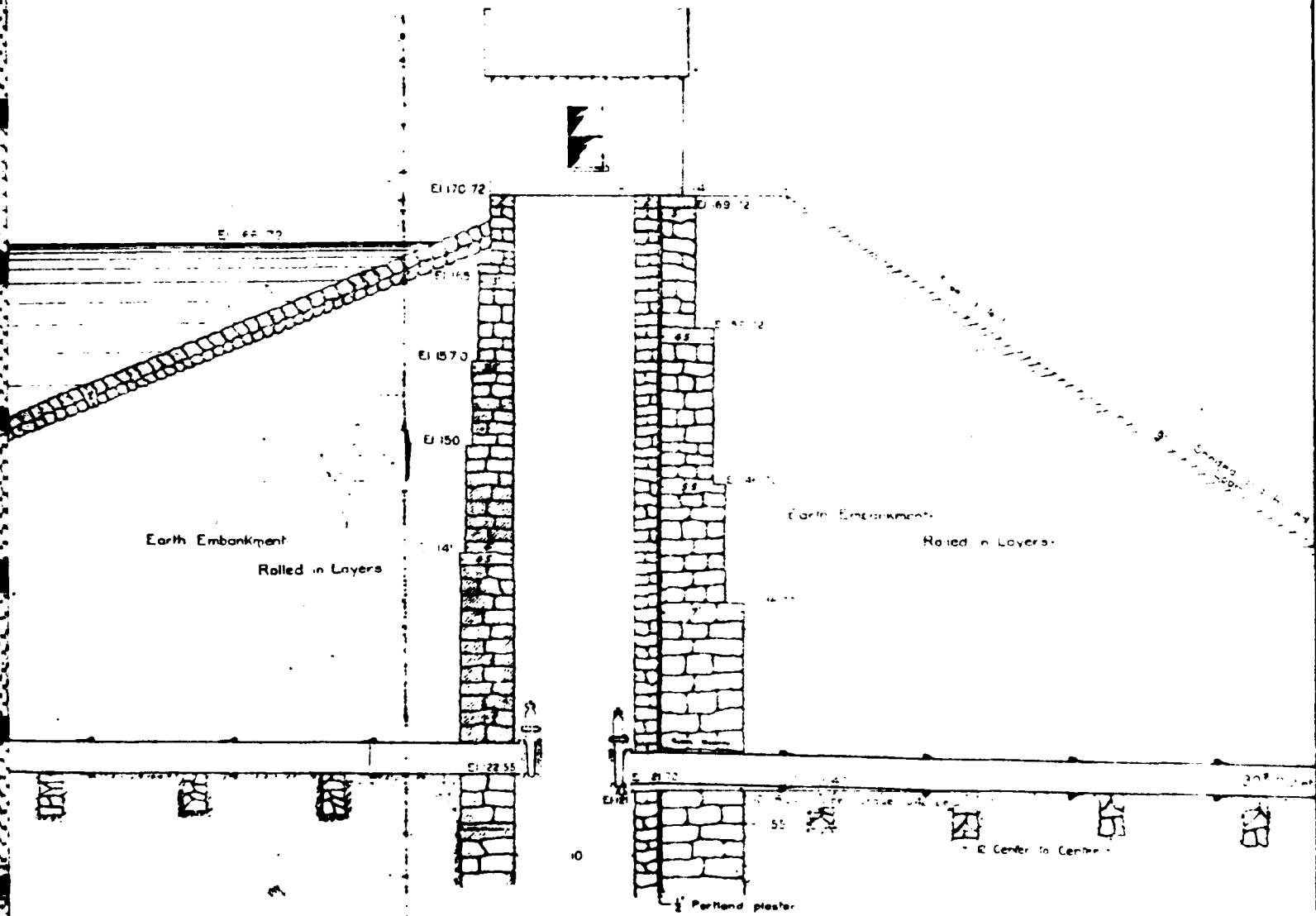
THE BRIDGEPORT HYDRAULIC CO

SCALE 1 inch = 4 ft.

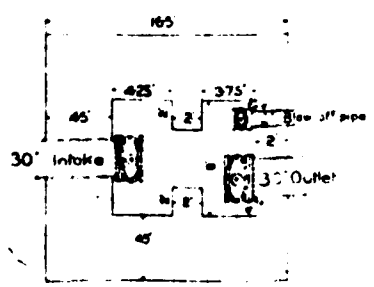
OCT. 1900-

S G Stoddard Jr Engineer

119



CROSS SECTION THROUGH GATE CHAMBER.



PLAN OF GATE CHAMBER.

NOTES:
1. DRAWING OBTAINED F
   BRIDGEPORT HYDRAUL
2. DATUM UNKNOWN

2

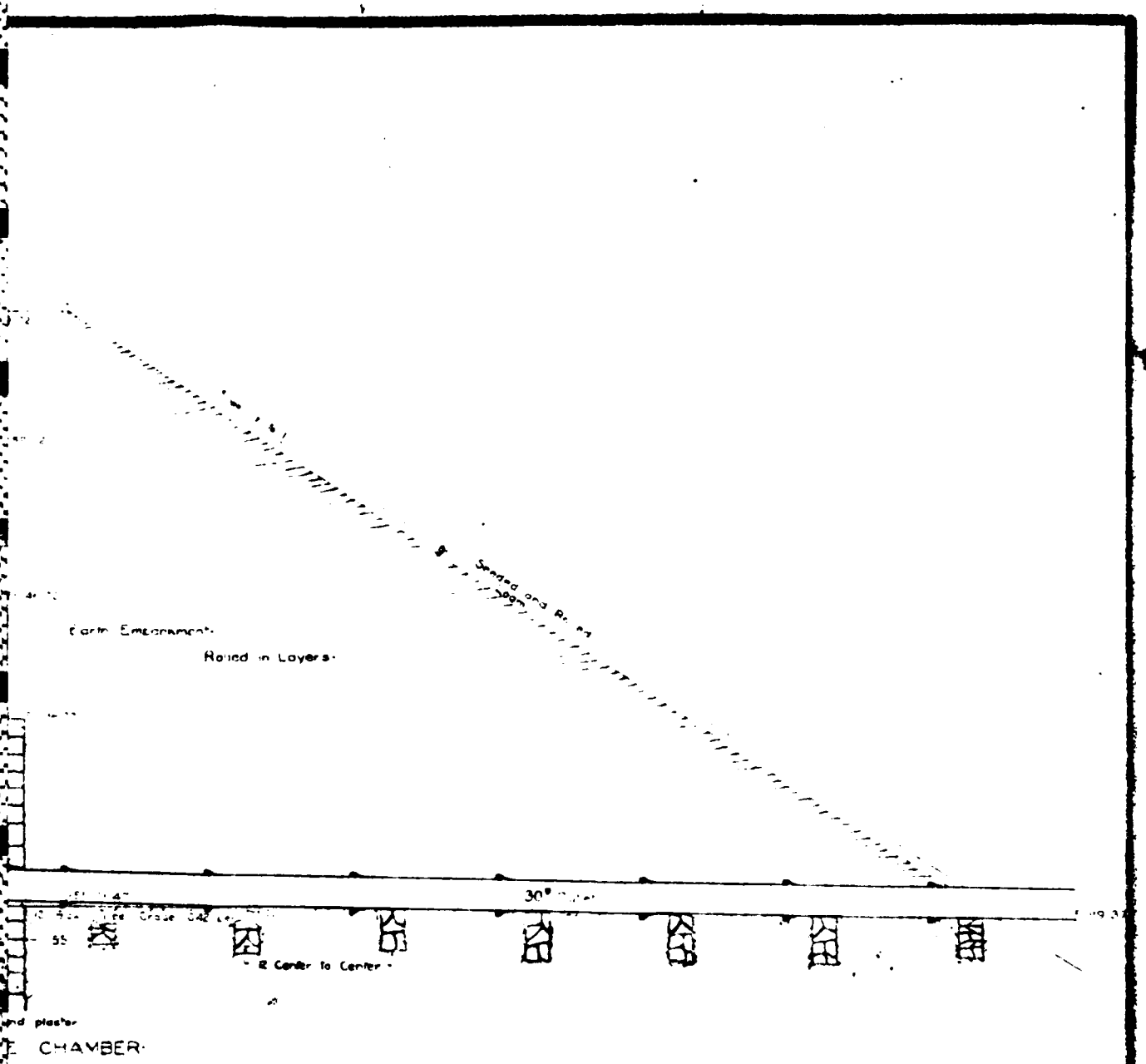
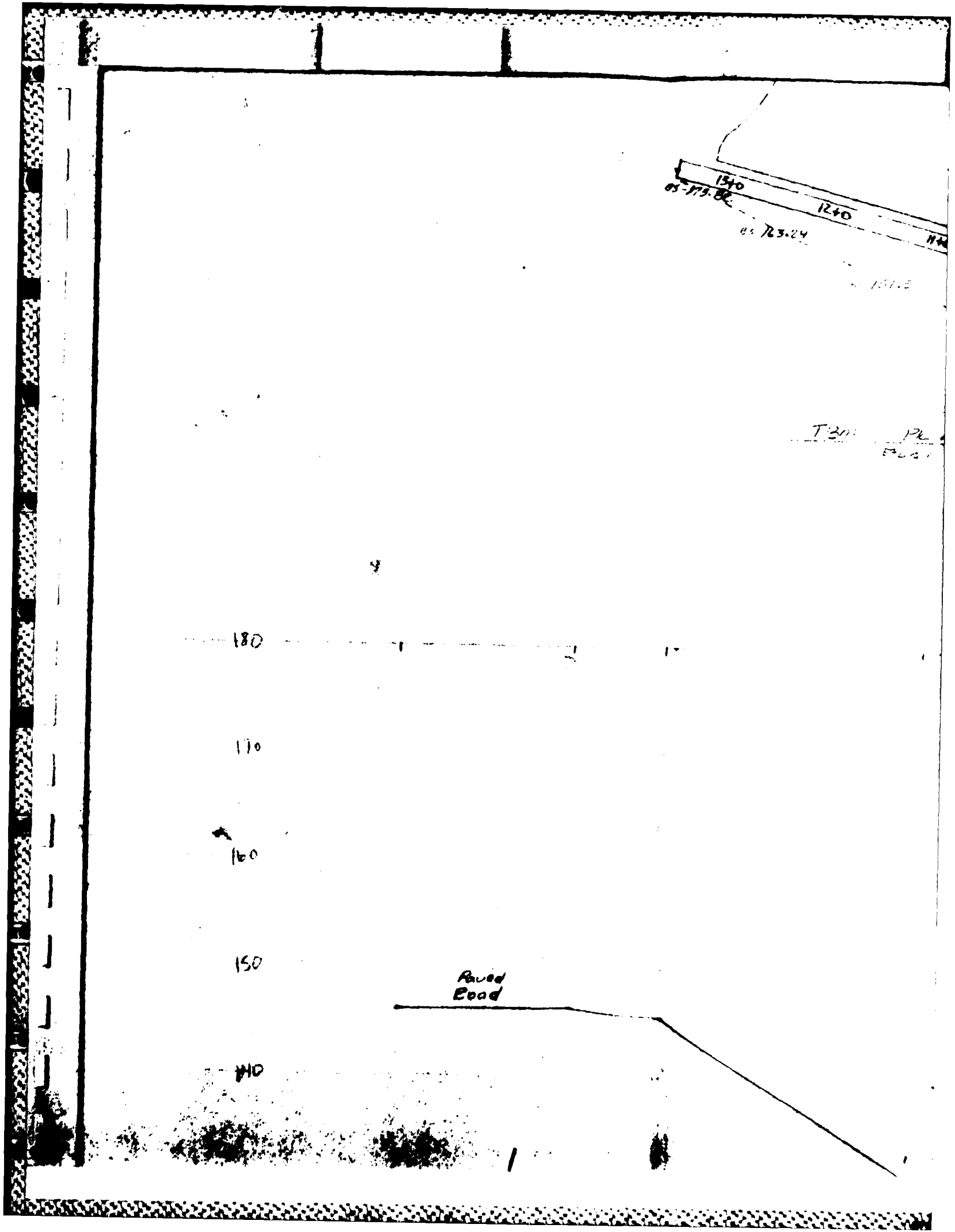


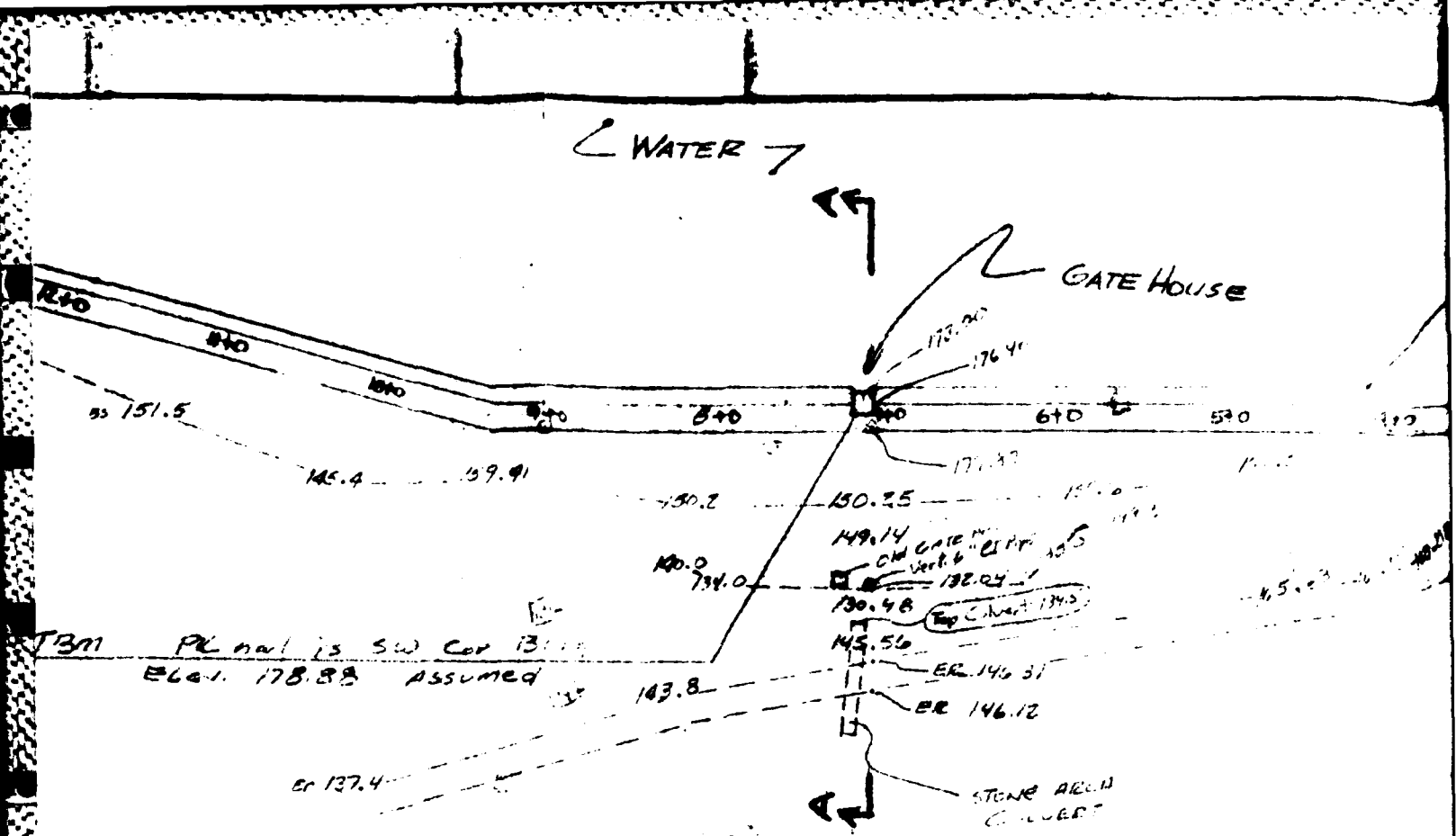
FIGURE - 2

NOTES:
1. DRAWING OBTAINED FROM BRIDGEPORT HYDRAULIC CO.
2. DATUM UNKNOWN

PHILIP W. GENOVESE & ASSOCIATES, INC. ENGINEERS HAMDEN, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORP OF ENGINEERS WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS BEAVER DAM LAKE DAM	
DES BY	CHK BY	APP BY	DATE 6/13/79	SCALE NTS

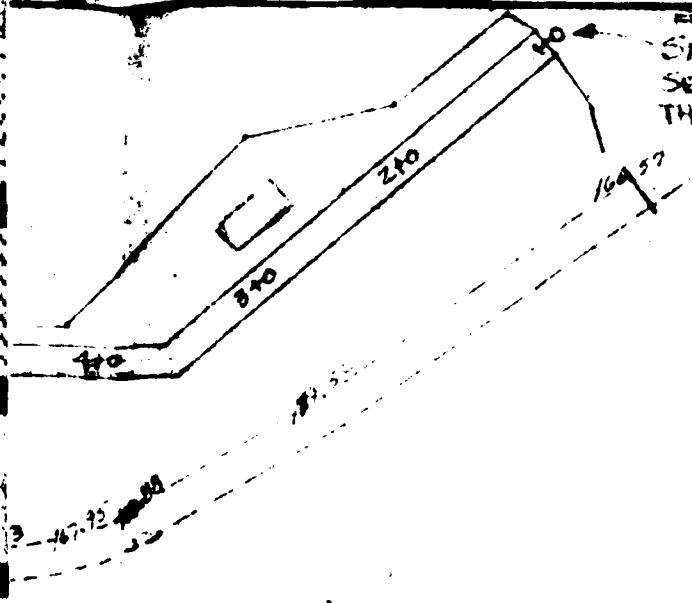
2


1340
1240
180
170
160
150
Paved
Road
140



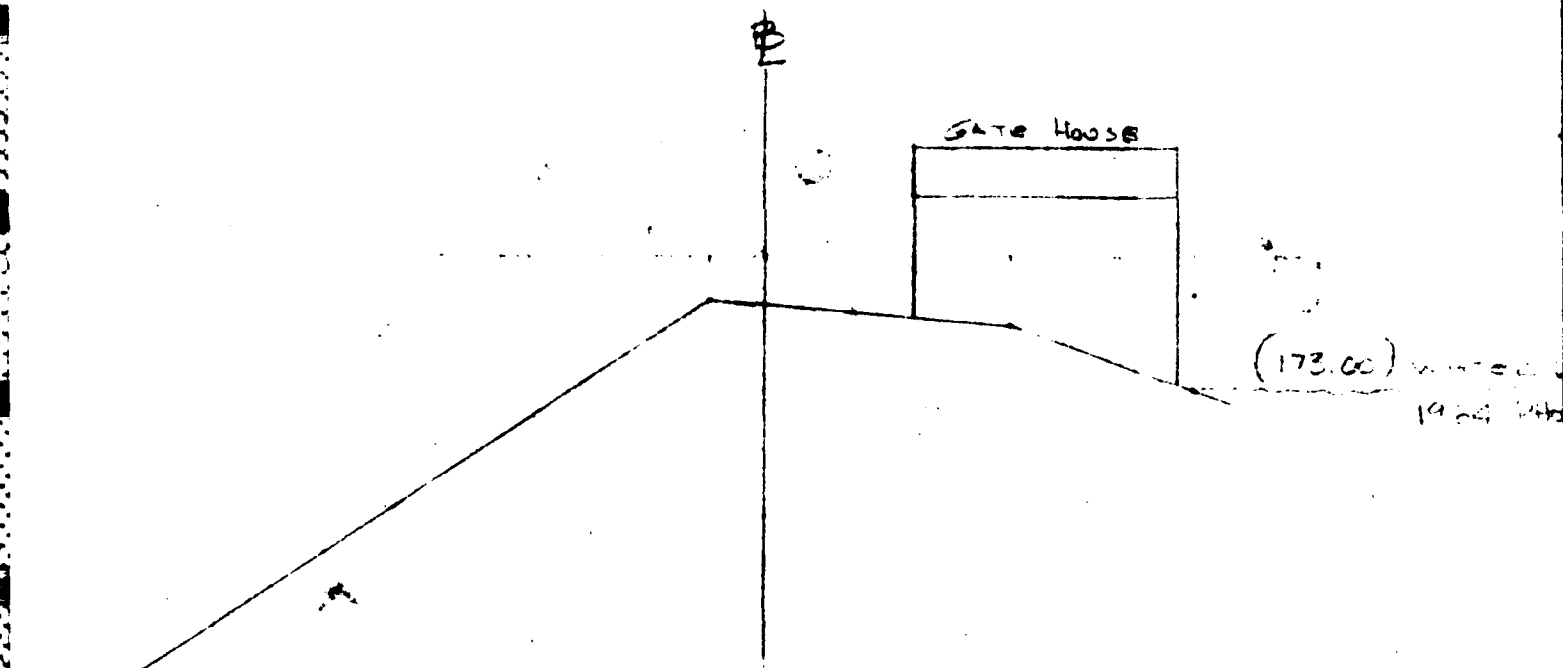
PLAN
1" = 100'

SECTION A
SCALE: 1" = 10' (HOR &

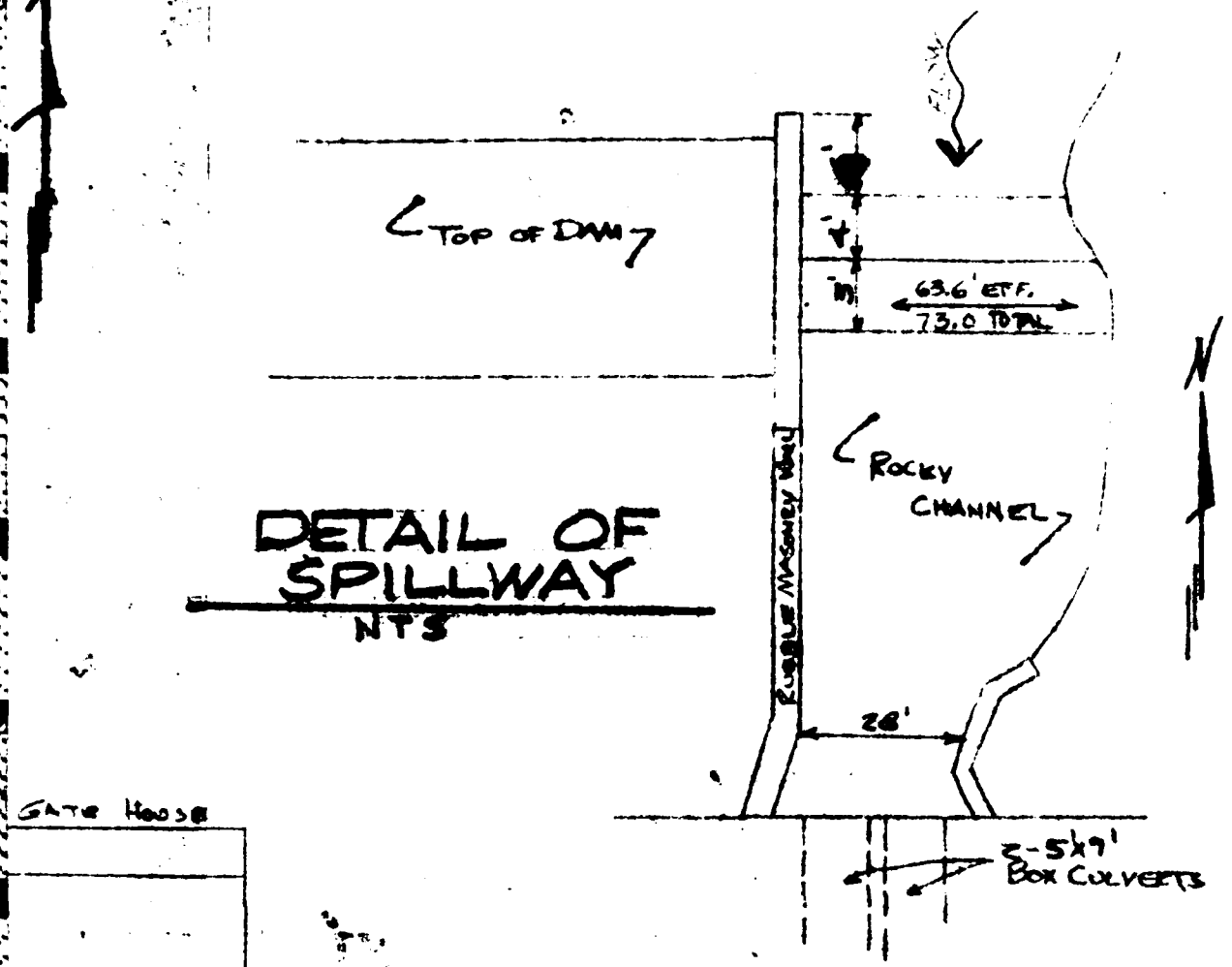


℄ TOP OF DAM

DETAIL OF
SPILLWAY
NTS



A-A
(Not to Scale)



DETAIL OF SPILLWAY

NTS

(173.00) WATER LEVEL (Based on [illegible])

1964 PHOTO Rev. 1973

NOTES:

1. ALL INFORMATION SHOWN WAS OBTAINED BY FIELD SURVEY METHODS.
2. DATUM IS M.S.L.

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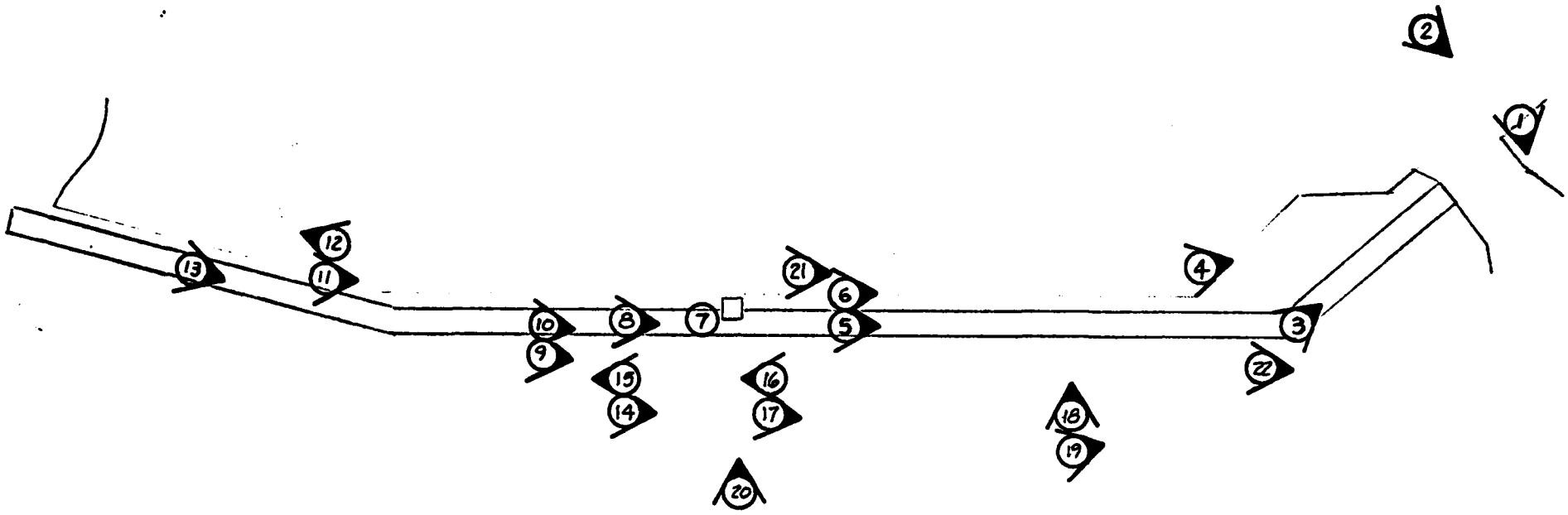
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

BEAVER DAM LAKE DAM

APPENDIX C

PHOTOGRAPHS



N

LEGEND

(4) NUMBER REFERS TO CAPTION. ARROW INDICATES DIRECTION OF PHOTOGRAPH.

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NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

BEAVER DAM LAKE DAM

DWN. BY	CKD BY	APP. BY	DATE	SCALE
MJS	NRS	RLJ	2/21/79	N.T.S.

PHOTO NO. 1 - From left side of spillway looking downstream along spillway channel.

PHOTO NO. 2 - From bridge looking upstream along right spillway wall.

PHOTO NO. 3 - Looking toward left abutment, from 200 feet right of spillway along upstream face, riprap in good condition, extensive overgrowth near top of slope.

PHOTO NO. 4 - Taken from end of dock extending into reservoir toward left abutment.

PHOTO NO. 5 - Looking to the east along downstream slope, from 600 feet right of spillway, extensive vegetation, trees up to 1 inch diameter.

PHOTO NO. 6 - Looking along crest, from 600 feet right of spillway; note slope of crest toward reservoir, trees along crest of upstream slope.

PHOTO NO. 7 - West corner of gatehouse, 3 inch separation between gatehouse and masonry cut block wall, opening extends 5 feet deep, water at base of opening.

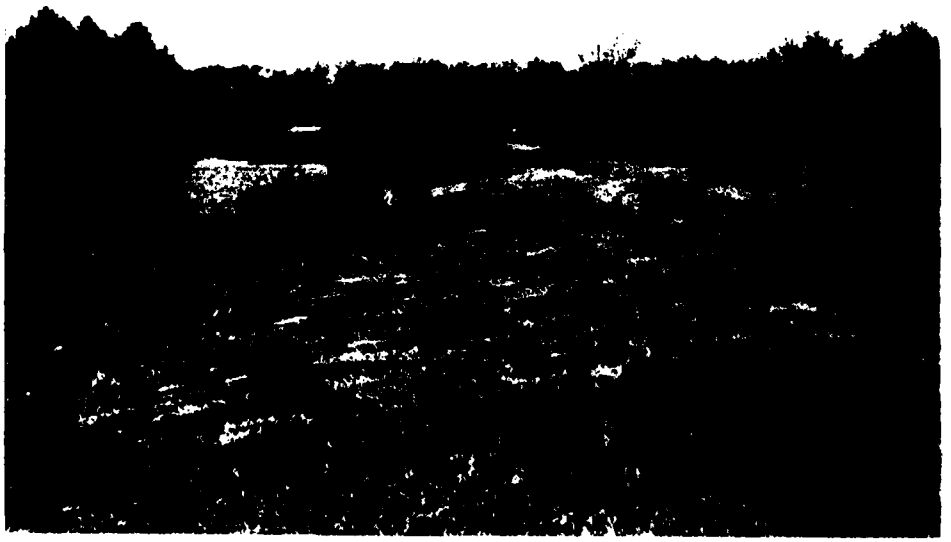


PHOTO NO. 8 - Looking east along crest, about 750 feet right of spillway, crest gradually slopes toward the reservoir, riprap appears in good condition.

PHOTO NO. 9 - Looking east along downstream slope from about 825 feet right of spillway, former dam can be seen in rear of photo.

PHOTO NO. 10 - Looking along crest toward the left from about 825 feet right of spillway at angle point.

PHOTO NO. 11 - Looking left along upstream face of dam from about 1000 feet right of spillway.

PHOTO NO. 12 - Looking right along upstream face of dam from about 1000 feet right of spillway.

PHOTO NO. 13 - Looking left along crest of dam from about 1200 feet right of spillway.

PHOTO NO. 14 - Toe of slope on top of rock formation looking left along downstream slope from about 800 feet right of spillway.

PHOTO NO. 15 - Same as Photo 14 except looking right. Soda drink can locates woodchuck hole.

PHOTO NO. 16 - About 30 feet downstream of toe on top of former dam looking toward old gatehouse, from 650 feet right of spillway. Trees up to 18 inches in diameter growing on crest and downstream slope of old dam.

PHOTO NO. 17 - Toe of slope, looking left from about 650 feet right of spillway, large trees along crest and downstream slope of old dam, brush up to 5-6 feet in height.

[illegible] about 15 feet up from the toe [illegible] 250 feet right of spillway. [illegible] 12 inch in diameter, extends [illegible] inches before it changes direction.

PHOTO NO. 19 - From location of Photo 18, looking left along slope; note extensive undergrowth.

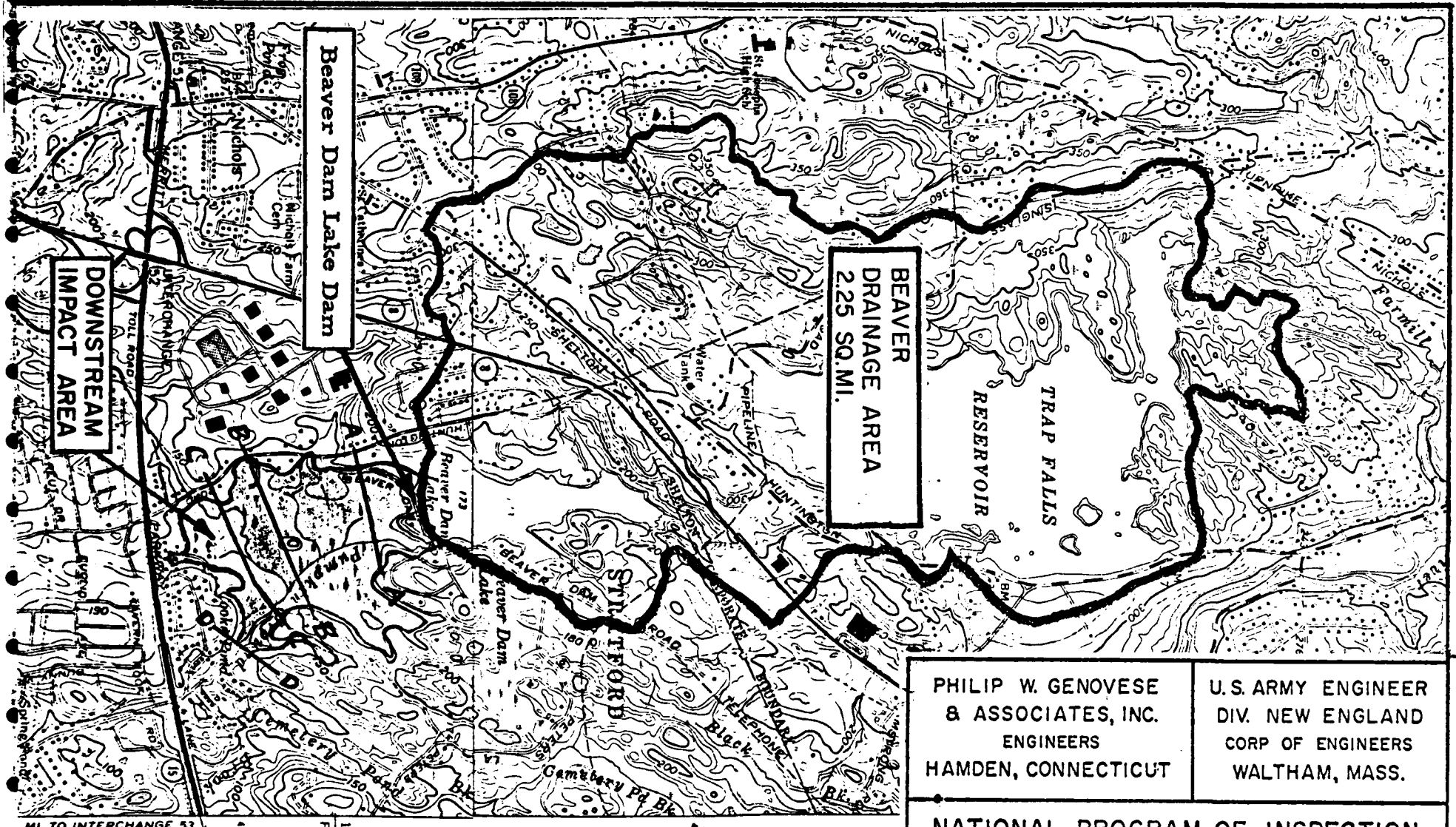
PHOTO NO. 20
Downstream of dam on crest of roadway, looking upstream toward upper gatehouse.

PHOTO NO. 21 - About 600 feet right of spillway, evidence of past movement of crest toward reservoir, up to 12 inch of vertical displacement.

PHOTO NO. 22 - Downstream face of dam looking to left abutment from about 220 feet right of spillway.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



USGS QUADRANGLES	
BRIDGEPORT	1960
LONG HILL	1973

PHILIP W. GENOVESE & ASSOCIATES, INC.
ENGINEERS
HAMDEN, CONNECTICUT

U.S. ARMY ENGINEER
DIV. NEW ENGLAND
CORP OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

BEAVER DAM LAKE DAM

DRAINAGE AREA

DWN. BY	CKD. BY	APP. BY	DATE	SCALE
MJS	NRS	RLJ	6/13/79	NTS

Name	Beaver Lake Dam
Location	Stratford, Conn.
Drainage Area	1440 acres / 2.25 sq. miles
Flow Line	Elev 173.0 (USGS)
Top of Dam	Elev 177.8
Dam Height	47.3 feet
Size & Hazard	Intermediate & High
Test Flood (TF)	PMF
TF Runoff	19 inches
TF Peak Discharge	1350 cfs
TF Volume	2279 Ac-Ft
Spillway Storage	318 Ac-Ft (no freeboard)
Q_{TF} Outflow	1225 cfs
Stage @ Q_{TF} Outflow	Elev 176.2
Spillway Type	Broad crested Large mortared stone cap.
Breaching Q_p	109,391 cfs
Reach Outflow	24,134 cfs (3400' downstream)
Reach Outflow Flood Stage	Elev 138.5 (17.5' depth)

Evaluate size & hazard classification in order to select design storm for test flood.

Size Classification

Top of Dam = elev 177.8 USGS
Downstream Low point = elev 130.5
Height of Dam = 47.3 feet

Reservoir area @ flow line = 57 acres
∴ estimated volume below the flow line = $\frac{1}{3}bh = \frac{1}{3} \times 57 \times 47.3 = 898$ Ac-Ft

Volume between the flow line & top of Dam = 318 Ac-Ft which yields a total storage of 1216 Ac-Ft

From Table #1 of OCE guides the Size classification is Intermediate

Hazard Potential

The dam outlets to Pumpkin Ground Brook which flows thru suburban areas of Stratford for about 3 miles before outletting into the Housatonic River. Immediately below the dam for a distance of 3000' and a width of 2000' is a large low-lying wetland area. There are approximately 30 houses that set @ the edge of the wetlands. Cooks Pond lies about 4000 feet south of the dam and has approximately 25 houses set @ the edge of the pond. There is more development

further downstream, also @ the edge of Pumpkin Ground Brook. A major highway, the Merrit Parkway, lies approximately 5500' downstream of the Dam.
~~Therefore~~ a hazard potential classification of High will be selected.

Spillway Design Storm

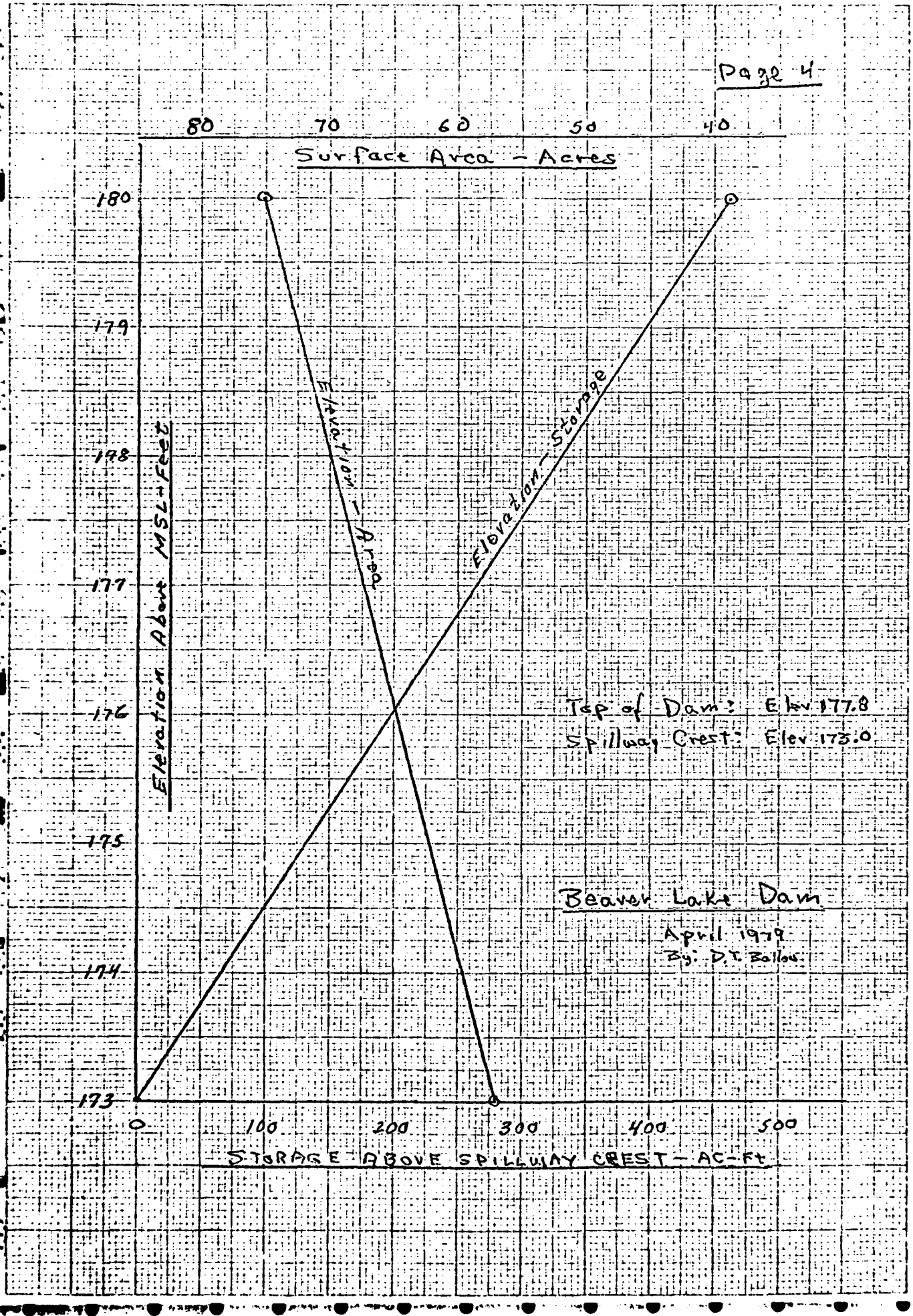
From table #3 of the OCE guides entering with "intermediate" & "High" a storm equivalent to the PMF is required

Drainage Area = 2.25 sq-miles

utilizing data furnished by the Corp, N.E.D. entering with D.A. = 2.25 & selecting a point less severe than Flat & coastal we obtain a unit flow of 600 cfs/sq-mile. This was done because about 50% of the drainage area is primarily water surface & wetlands

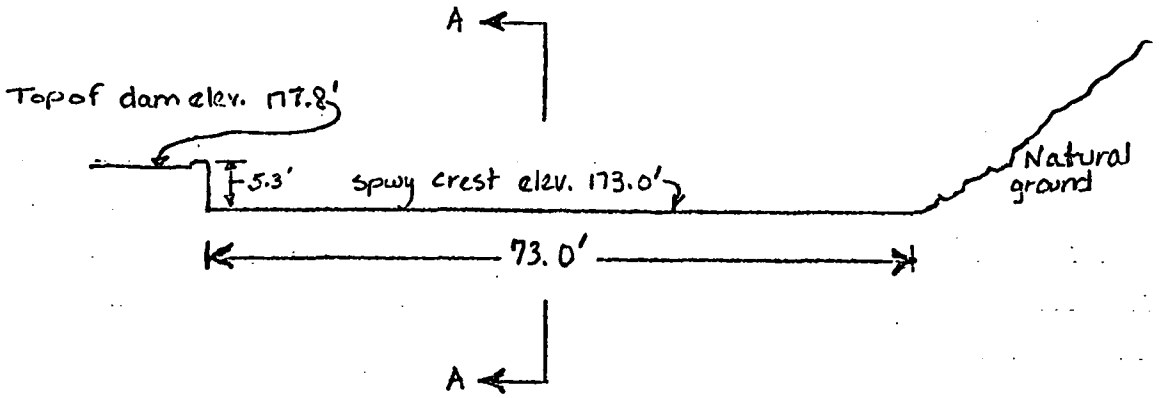
$\therefore$ SDF = 2.25 mi² x 600 cfs/mi² = 1350 cfs

Volume of PMF = 53.3 x 2.25 x 19" = 2279 Ac-Ft
Note that there is 318 Ac-Ft between the flow line & top of Dam.

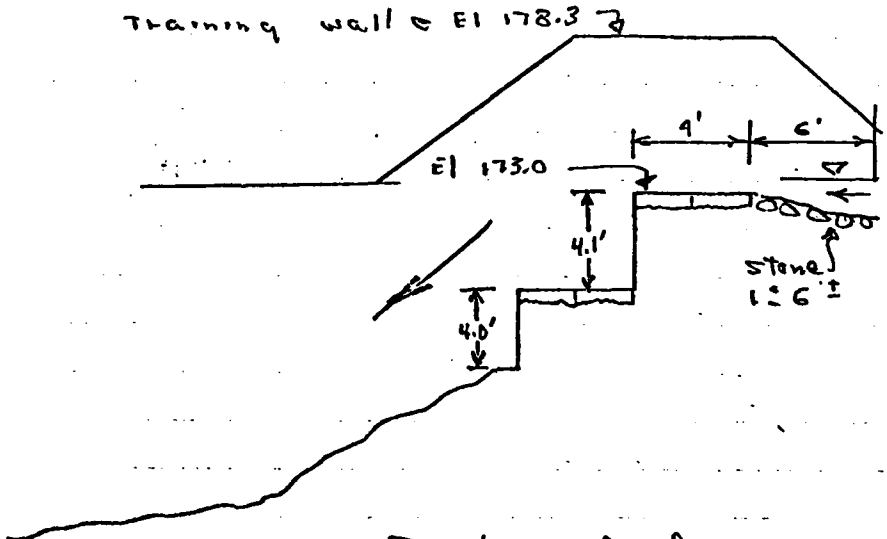

80
70
60
50
40
Surface Area - Acres
180
179
178
177
176
175
174
173
Elevation Above MSL - Feet
Elevation - Area
Elevation - Storage
Top of Dam: Elev 177.8
Spillway Crest: Elev 173.0
Beaver Lake Dam
April 1979
By: D.T. Ballou
0
100
200
300
400
500
STORAGE ABOVE SPILLWAY CREST - AC-Ft

Beaver Lake Dam, Stratford, Conn.

Service Spillway



Elevation View
Looking UPSTREAM
N.T.S.



Section A-A
NTS

Work up Rating Curve for Service Spillway

The approach to the spillway is about a slope of 1:5, use a weir coefficient of 3.0

$$Q = CLH^{3/2}$$

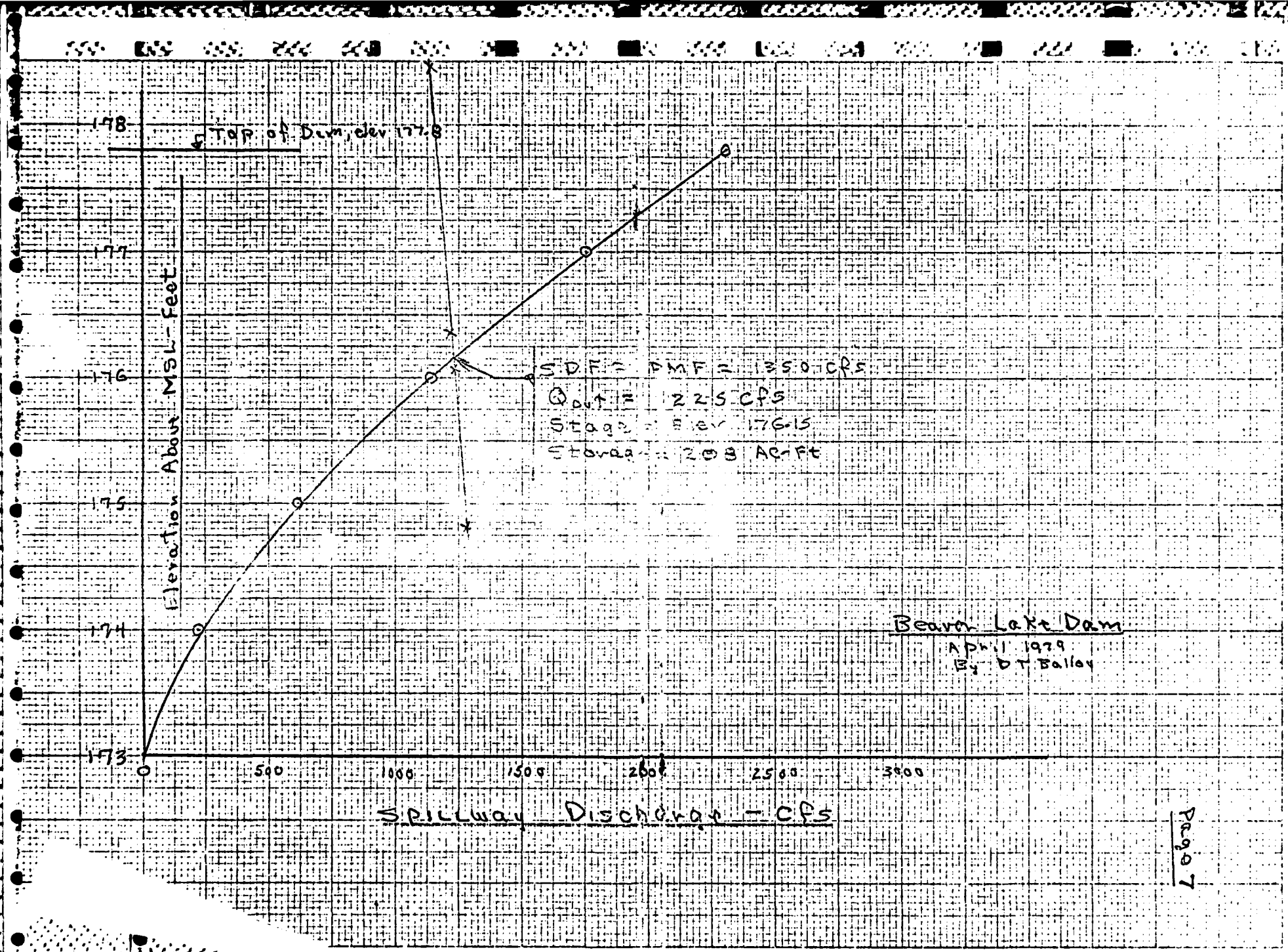
$C = 3.0$

$L = 73'$

Q = flow in cfs = $219 H^{3/2}$

H = head on weir in feet

H feet	① cfs	
0	—	= spillway crest = elev 173.0
1	219	
2	619	
3	1138	
4	1752	
4.8	2303	= Top of dam = elev 177.8


Top of Dam, elev 177.8
178
177
176
175
174
173
Elevation Above MSL - Feet
0
500
1000
1500
2000
2500
3000
Spillway Discharge - CFS
SDF = PMF = 1350 CFS
Qout = 225 cfs
Stage = Elev 176.15
Storage = 208 AC-Ft
Beaver Lake Dam
April 1979
By D T Bailey
Page 7

Short-cut Routing of PMF, 1350 cfs = Q_{p_1}

Select Surcharge Storage associated with
Q_{p_1} = 1350 cfs
From stage-discharge curve for Q = 1350 cfs
we obtain elev 176.35
From stage-storage curve for elev 176.35
we obtain 220 ac-ft.

$$\frac{220 \text{ Ac-Ft}}{1440 \text{ acres}} \times 12 \frac{''}{ft} = 1.83 \text{ inches of RO} = \text{Stor}_i'$$

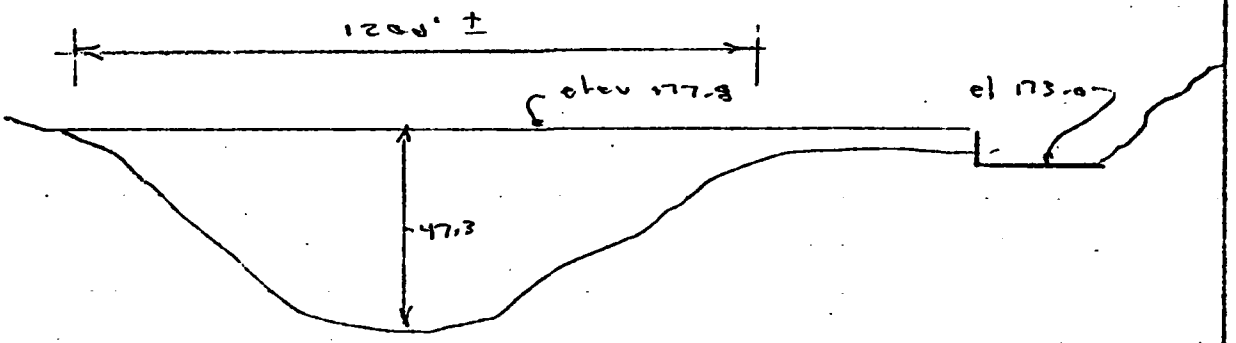
$$Q_{p_i} = Q_{p_1}\left(1 - \frac{\text{Stor}_i'}{19''}\right)$$

①	②	③	④	⑤
Stor_i' inches	$\left(1 - \frac{\text{Stor}_i'}{19''}\right)$	Stor_i' Ac-ft ① × Area	Q_{p_i} cfs ② × 1350 cfs	Elev from page 4 for col. ③
1.83	0.904	220	1220	176.35
3.00	0.842	360	1137	178.45
1.00	0.947	120	1278	174.80
1.70	0.911	204	1230	176.08

Plots of column ④ & ⑤ may be found on page 7 with accompanying results.

Estimate dam breaching hydrograph

Effective top width of dam ≈ 1200'



Vertical Section
Looking Upstream

Dam width @ mid-height ≈ 500'
Failure width = 40% × 500 = 200' = W_b
Y_o = 47.3 feet
and:
Peak Failure Outflow = $\frac{8}{27} W_b \sqrt{g}\, Y_o^{3/2} = Q_{P_1}$

$Q_{P_1} = \frac{8}{27} \times 200 \times 32.2^{1/2} \times 47.3^{3/2}$ (325.31)

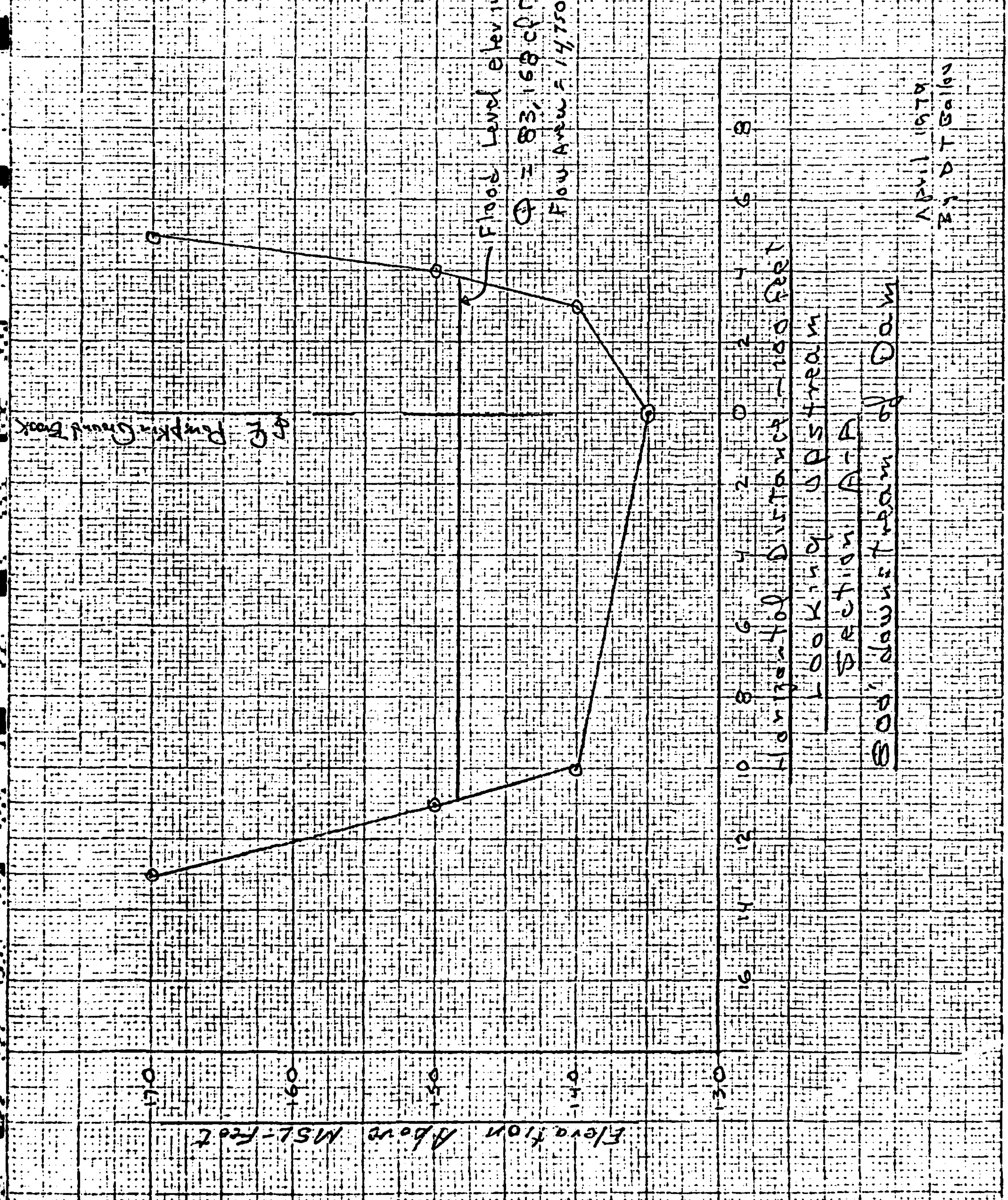
= 109,391 cfs

Reservoir storage to top of Dam
= 1216 AC-Ft

Failure wave @ dam has height ≈ 2/3 Y_o ≈ 31.5'

perform downstream routing of wave

Beaver Lake Dam



Beaver Lake Dam

Work up rating curve for Section A-A which is 800 feet downstream of the dam.

Use $Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$

where $n = 0.075$

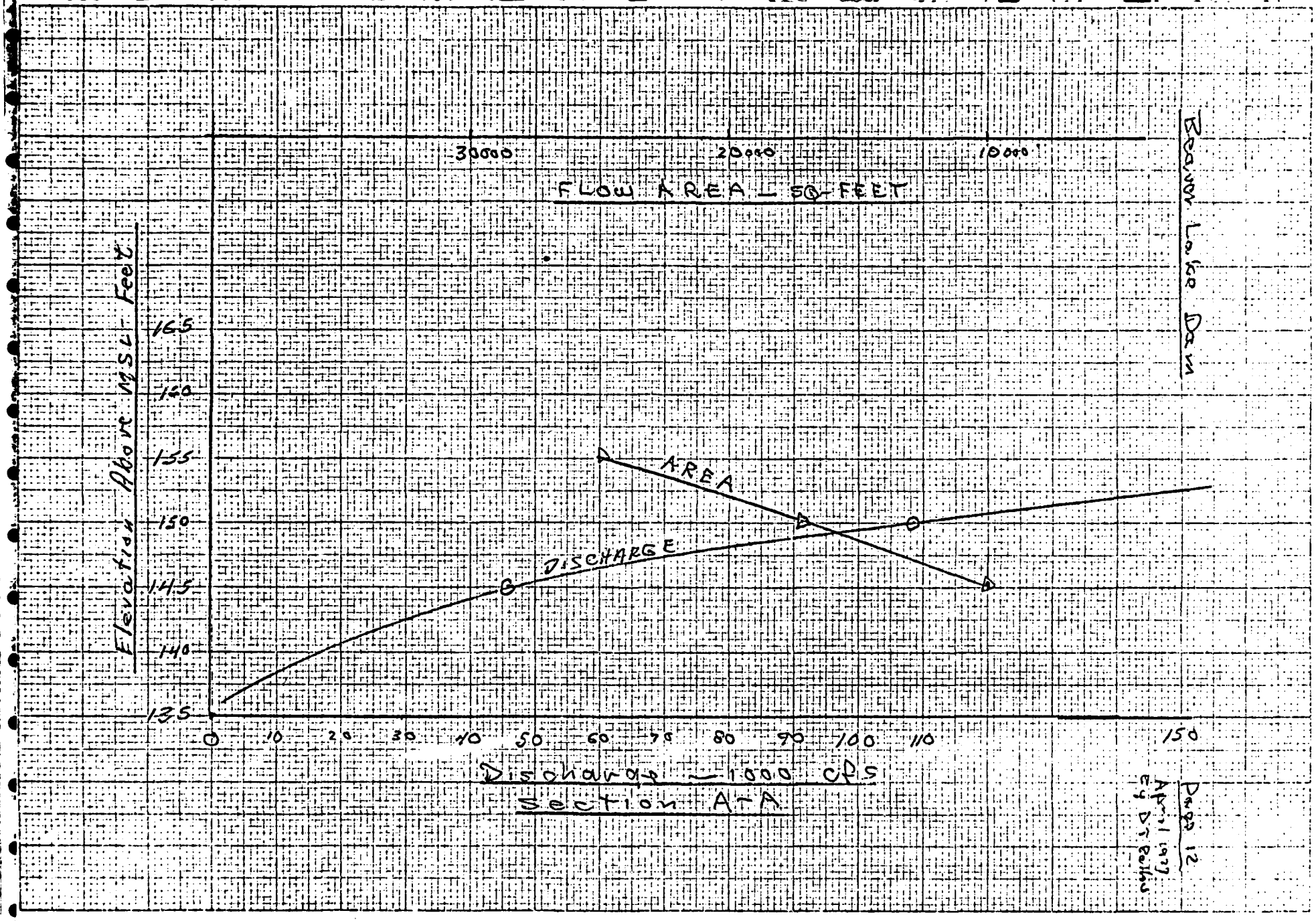
$S = 19/2500 = 0.004$

$S^{1/2} = 0.063$

and:

$$Q = 1.25 A R^{2/3}$$

Elev	Area ft^2	WP	R	$R^{2/3}$	Q cfs
135	—	—	—	—	—
145	10,000	1420	7.04	3.67	45,919
150	17250	1530	11.27	5.03	108,400
155	24950	1620	15.4	6.19	193,021


Beaver Lake Dam
FLOW AREA - SQ. FEET
30000
20000
10000
Elevation Above MSL - Feet
165
160
155
150
145
140
135
AREA
DISCHARGE
0
10
20
30
40
50
60
70
80
90
100
110
150
Discharge - 1000 CFS
Section A-A
Page 12
April 1977
by DT Pettus

Routing of flood wave by short-cut method from dam to section A-A

From page 9, Q_{p_1} = 109,391 cfs
storage @ time of breach = 1216 Ac-Ft

From page 12, stage-Discharge curve for Q_{p_1} we obtain elev 150.0 ft, from stage-area curve 17,250 ft² for elev 150.0

Reach length = 800', ∴ Volume, V_1 in reach
= 800 × 17,250 ft² / 43560 = 317 Ac-ft

Trial $Q_{p_2} = Q_{p_1}\left(1 - \frac{V_1}{S}\right)$ = $109,391\left(1 - \frac{317}{1216}\right)$

= 80,874 cfs

using Q_{p_2} we obtain elev 148.2 ft, Area = 14,500 ft² from page 12.

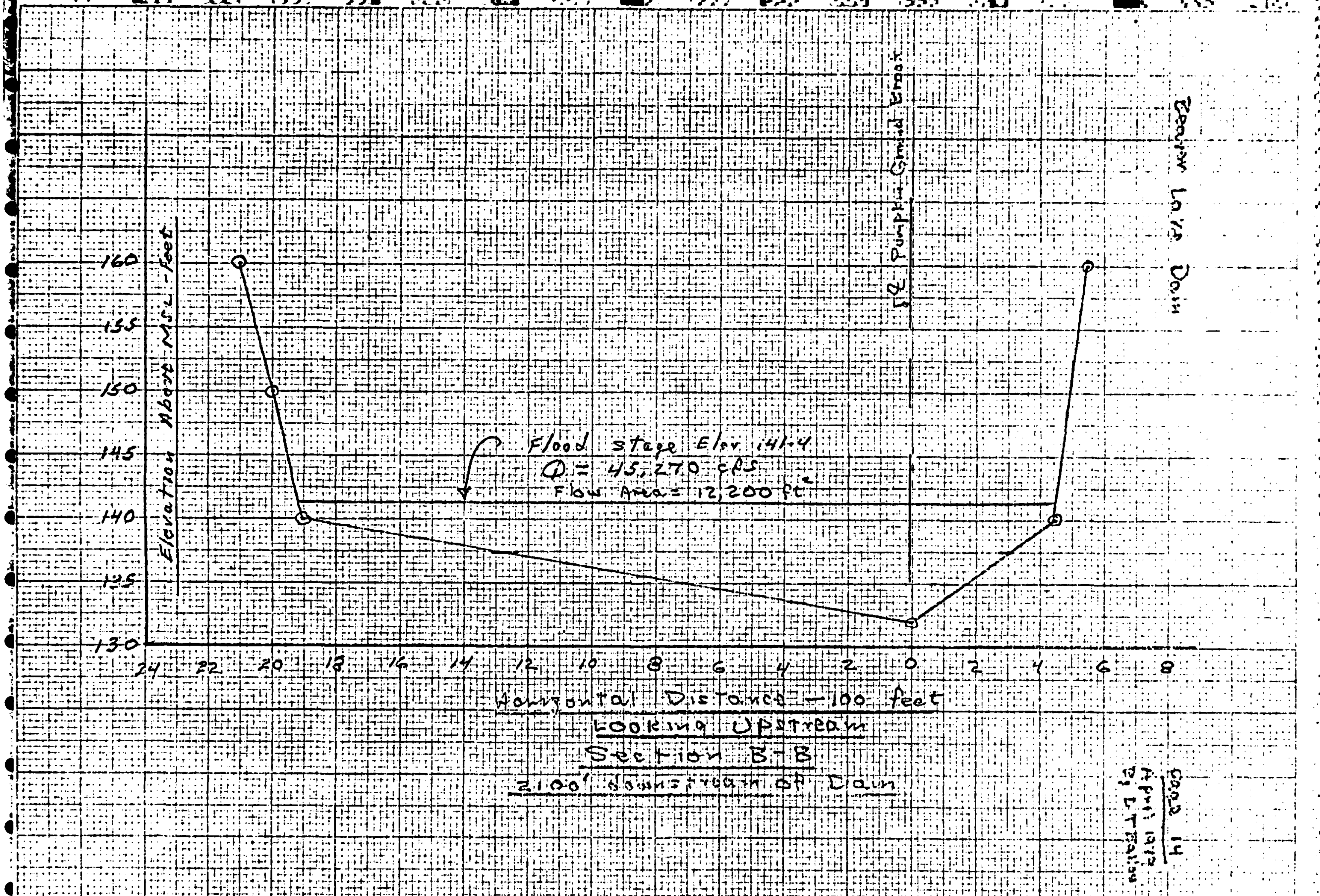
V_2 = 800 × 14,500/43,560 = 266 Ac-ft

Recomputed Q_{p_2} = $109,391\left(1 - \frac{(V_1+V_2)/2}{1216}\right)$ = 83,168 cfs;
and flood stage = elev 148.4

Select another section downstream & repeat the process

Q_{p_1} = 83,168 cfs

S = 1216 − (266+317)/2 = 925 Ac-ft


Beaver Lake Dam
Page 14
April 1977
℄ Pumpkin Grind Creek
Flood stage Elev 141.4
Q = 45,270 cfs
Flow Area = 12,200 ft²
Elevation Above MSL - feet
160
155
150
145
140
125
130
24 22 20 18 16 14 12 10 8 6 4 2 0 2 4 6 8
Horizontal Distance — 100 feet
Looking Upstream
Section B-B
2100' downstream of Dam

Work up rating curve for Section B-B

$$Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$$

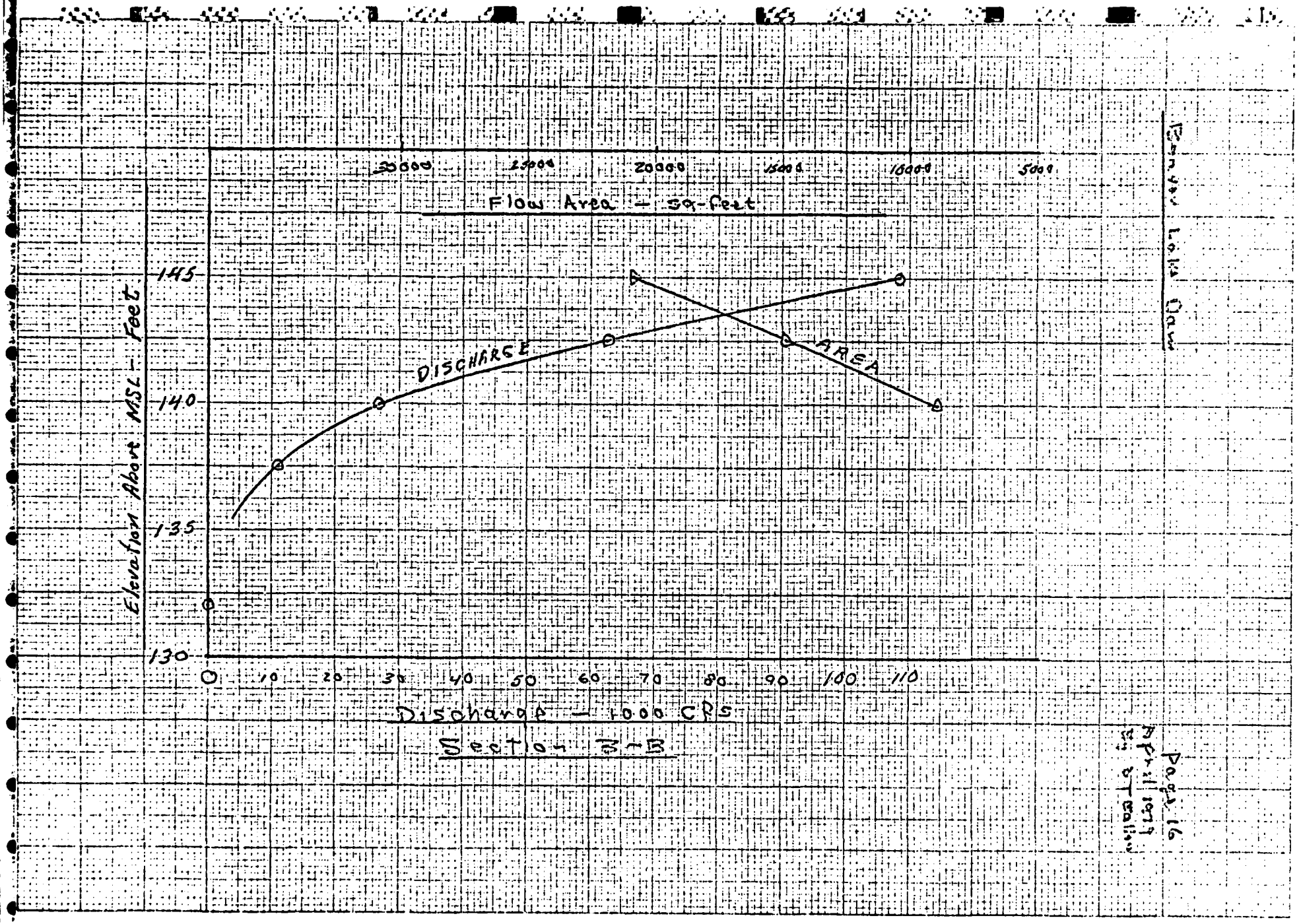
$n = 0.075$

$S = 0.004$ (same as A-A)

$S^{1/2} = 0.063$

$$Q = 1.25\ A R^{2/3}$$

Elev	Area ft^2	WP ft	R	$R^{2/3}$	Q cfs
132.0	—	—	—	—	—
137.5	4455	1631	2.73	1.95	10,830
140	8905	2366	3.76	2.42	26,931
145	20,815	2446	8.51	4.16	108,210
142.5	14,830	2391	6.20	3.37	62,502



Penrose Lake Dam

Page 16

Continue routing flood wave from Section A-A → Section B-B

From page 13:

$Q_{p_1} = 83,168$ cfs , $S = 925$ Ac-Ft

From page 16 entering stage-discharge curve with Q_{p_1} we obtain elev 143.6 ft, area = 17,500 ft²

Reach length = 1300', ∴ V_1 in reach = 1300 × 17,500/43560 = 522 Ac-Ft

Trial $Q_{p_2} = Q_{p_1}\left(1 - \frac{V_1}{S}\right) = 83,168\left(1 - \frac{522}{925}\right) = 36,234$ cfs

using Q_{p_2} we obtain elev 140.75 ft, Area = 10,750 ft²
∴ V_2 = 1300 × 10,750/43,560 = 321 Ac-Ft

Recompute Trial Q_{p_2}

$$Q_{p_2} = 83,168\left(1 - \frac{(V_1+V_2)/2}{S}\right)$$

$$= 83,168\left(1 - \frac{(522+321)/2}{925}\right) \quad \text{422}$$

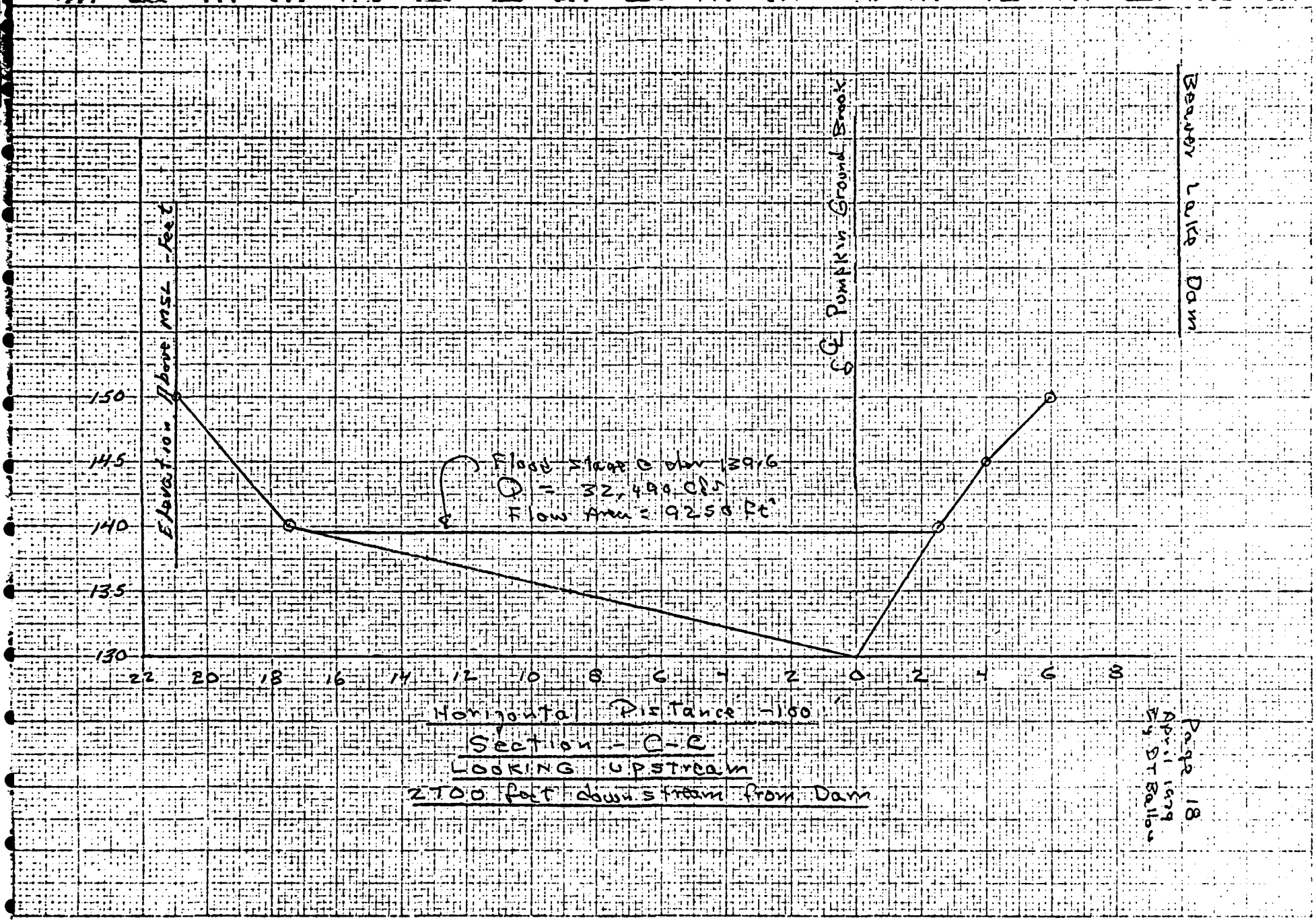
$$= \underline{45,270 \text{ cfs}}$$

and associated flood stage = elev 141.4

Select another section downstream for appraisal

$Q_{p_1} = 45,270$ cfs

$S = 925 - 422 = 503$ Ac-Ft


Beaver Lake Dam
C.L. Pumping Ground Brook
Elevation above msl - Feet
150
145
140
135
130
22
20
18
16
14
12
10
8
6
4
2
0
2
4
6
8
Flood Height Oct 1976
Q = 32,490 cfs
Flow Area = 9258 ft²
Horizontal Distance -100'
Section - C-C
LOOKING UPSTREAM
2700 feet downstream from Dam
April 1979
S.A. DeBallo
Page 18

Beaver Lake Dam

Page 19
April 1979
By D T Bellow

Work up rating data for section C-C

$$Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$$

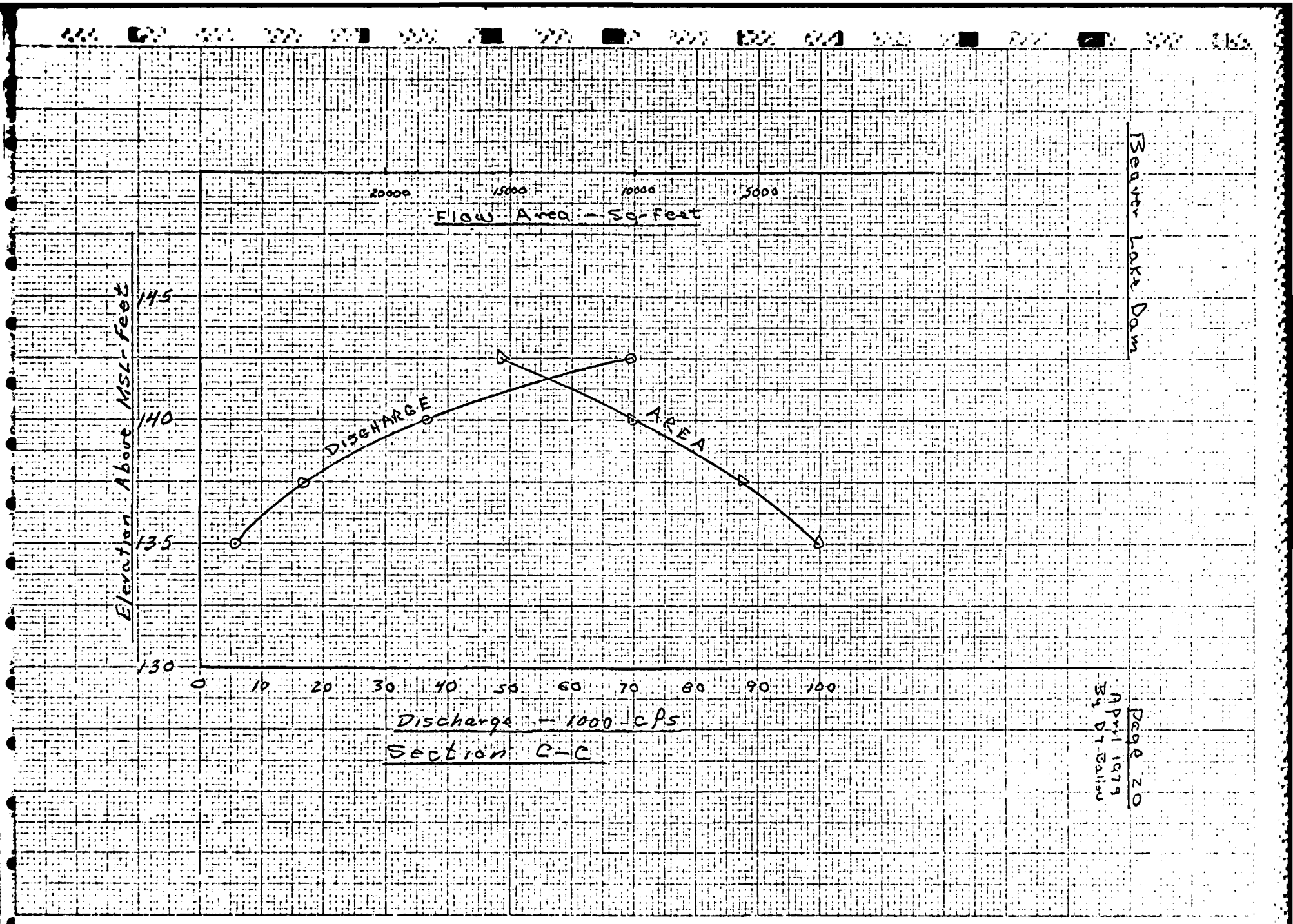
let $n = 0.075$

$S = 0.004$ (as in B-B & A-A)

$S^{1/2} = 0.063$

$$Q = 1.25 A R^{2/3}$$

Elev	Area ft^2	WP ft	R ft	$R^{2/3}$	Q cfs
130	—	—	—	—	—
135	2538	1025	2.48	1.83	5,802
137.5	5663	1525	3.71	2.40	16,960
140	10,101	2050	4.93	2.89	36,521
142.5	15,326	2200	6.97	3.64	69,788


Beaver Lake Dam
20000
15000
10000
5000
Flow Area - Sq-Feet
Elevation About MSL-Feet
145
140
135
130
DISCHARGE
AREA
0
10
20
30
40
50
60
70
80
90
100
Discharge - 1000 cfs
Section C-C
Page 20
April 1979
B4 DT Gallow

Continue routing flood wave from section B-B thru section C-C

From page 17:

Q_{p_1} = 45,270 cfs ε_1' S = 503 Ac-Ft

From page 20 using 45,270 cfs as entering argument we obtain: elev 140.8 ε_1 Area = 11,600 ft²

Reach length = 600', ∴ V_1 in reach will be
600' x 11,600/43560 = 160 Ac-Ft

Trial Q_{p_2} = $45{,}270\left(1-\frac{160}{502}\right)$ = 30,800 cfs

Using Q_{p_2} & re-entering page 20 we obtain:
elev 139.4 ε_1' 9000 ft²
hence: V_2 = 600' x 9000/43560 = 124 Ac-ft

and:

$$\text{Recomputed } Q_{p_2} = 45{,}270\left[1-\frac{160+124)/2}{503}\right]$$

$$= 32{,}490 \text{ cfs}$$

Associated flood stage = 139.6
" " Area = 9,250 ft²

"S" remaining = 361 Ac-ft

Evaluate an additional distance downstream of 400' using section C-C, i.e. data on pages 18, 19, 20 & 21. Reference-wise call this section C'-C' The 400' will use remaining wetlands ε_1' obtain a Q ε_1' elev for use @ Section D-D!

Continue routing from Section C-C → C'-C' which is 400' downstream of C-C, C-C & C'-C' are same sections for this analysis - see comment at bottom of page 21.

From page 21:

Q_{p_1} = 32,490 cfs ; S = 361 Ac-ft

From page 20 entering with 32,490 cfs we obtain elev 139.6 & 9250 ft² (this should be same as results on page 21 having that the same section is utilized!)

Reach length = 400' ∴ V_1 = 400 x 9250/43560 = 85 Ac-ft

Trial $Q_{p_2} = 32{,}490\left(1 - \frac{85}{361}\right) = 24{,}840$ cfs

using Q_{p_2} & re-entering page 20 we obtain E for 138.6 & Area = 7,500 ft²

Hence, V_2 = 400 x 7500/43560 = 69 Ac-ft

and:

$$\text{Recomputed } Q_{p_2} = 32{,}490\left[1 - \frac{(85+69)/2}{361}\right] = 25{,}568 \text{ cfs}$$

Associated flood stage = elev 138.75

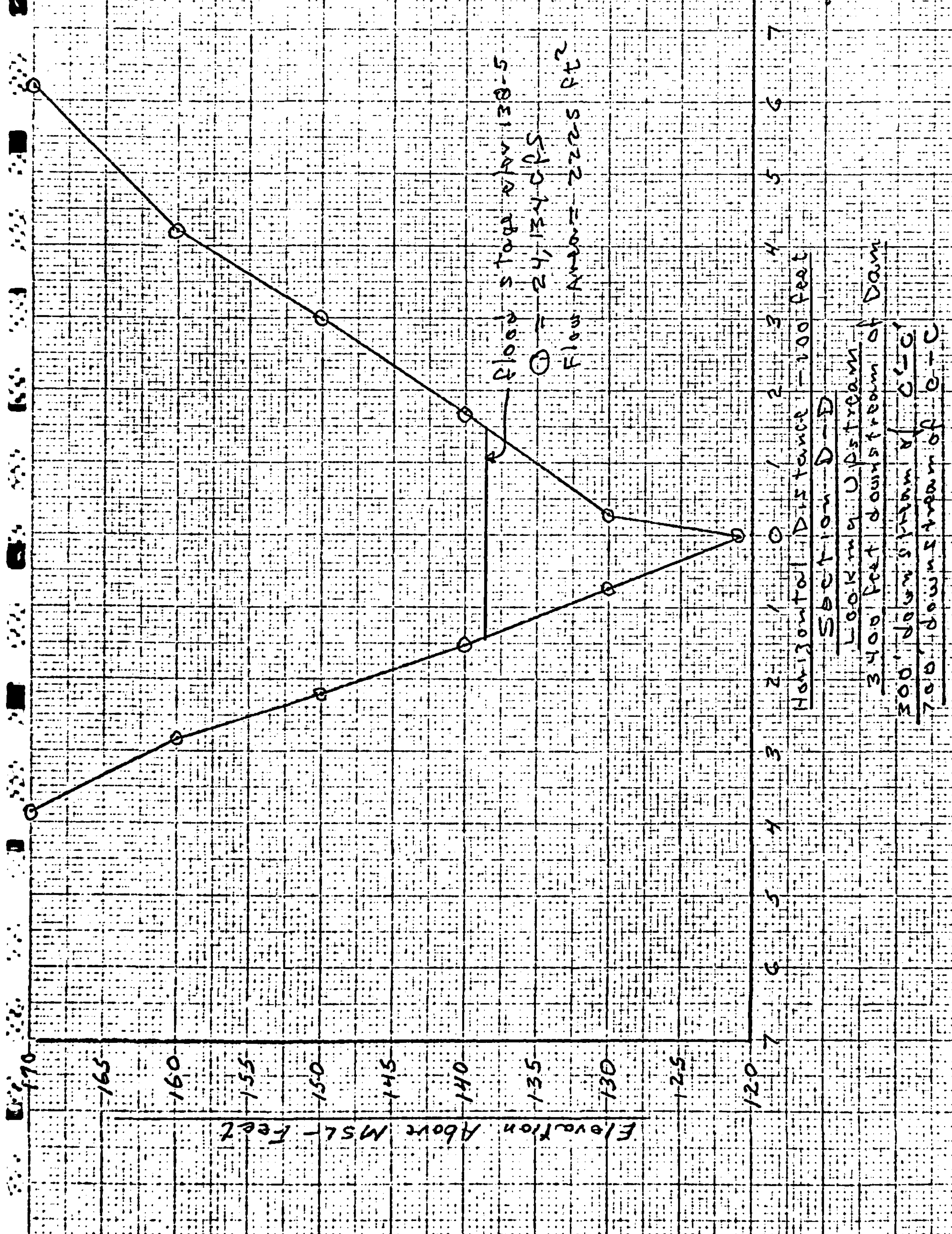
" " Area = 7750 ft²

"S" remaining = 361 - 77 = 284 Ac-ft

Note: This quicken analysis was just to obtain a reasonable Q, stage, & remaining storage to route thru D-D!

Beaver Lake Dam

Page 23
April 1979
By [illegible] Ballou



Work up rating curve for section D-D

$$Q = A \frac{1.49}{n} R^{2/3} S^{1/2}$$

$n = 0.075$

$S = 10/400 = 0.025$

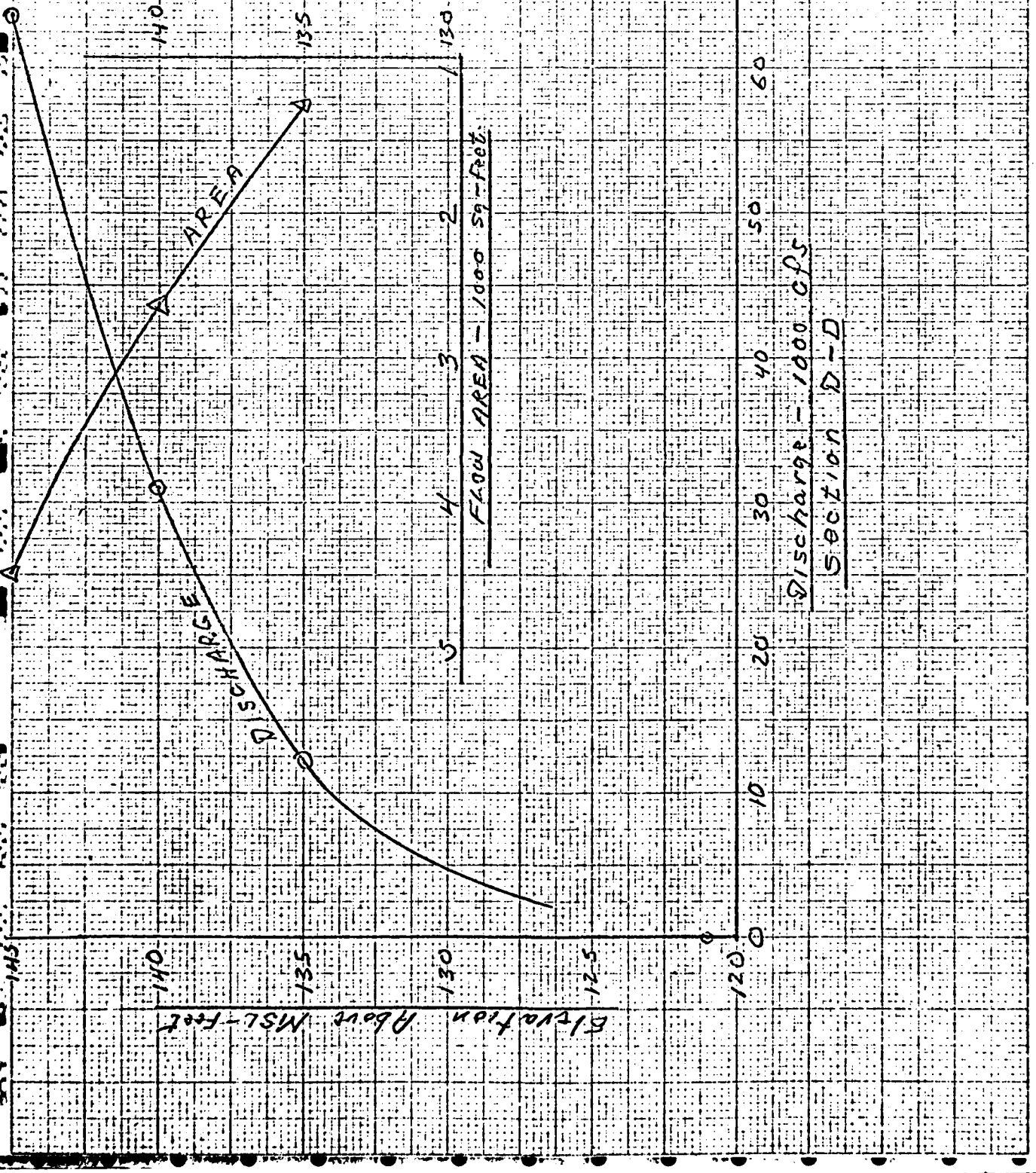
$S^{1/2} = 0.158$

$$Q = 3.14 A R^{2/3}$$

Elev	Area ft^2	WP ft	R	$R^{2/3}$	Q cfs
121	—	—	—	—	—
135	1250	228	5.48	3.11	12,190
140	2625	358	7.33	3.77	31,105
145	4475	464	9.64	4.52	63,570

Beaver Lake Dam

Page 25
April 1979
By D T Ballou



Continue routing from C'-C' to section D-D

From page 22:

Q_{p_1} = 25,560 cfs & S = 284 Ac-ft

From page 25, entering with 25,560 cfs we obtain elev 138.8 & Area = 2300 ft²

Reach length = 500', ∴ V_1 = 300 x 2300/43560 = 16 Ac-ft

Total $Q_{p_2} = 25{,}560\left(1 - \frac{16}{284}\right) = 24{,}134$ cfs

Using Q_{p_2} & re-entering page 25 we obtain elev 138.5 & Area = 2225 ft²
Hence V_2 = 300 x 2225/43560 = 15 Ac-ft

Do not recompute! Use Third Q_{p_2}

∴

Q_{p_2} = 24,134 cfs
flood stage = elev 138.5
"S" remaining = 269 Ac-ft

Summary of routing

Point	Discharge	Flood stage	Comment
Dam	1,225 cfs	176.2	Before breaching
Dam	109,391	146.3	Estimated based on comp data
A-A	83,168	148.4	sta 8+00
B-B	45,270	141.4	sta 21+00
C-C	32,490	139.6	sta 27+00
C'-C'	25,560	138.8	sta 31+00
D-D	24,134	138.5	sta 34+00

See Comments following page

Conclusions & Comments

The routing will not be continued past section D-D because:

1. It is obvious that within 3400' below the dam we have dissipated 1216 - 269 = 947 Ac-ft of storage, have 269 Ac-ft left, have fully exhausted the rather large storage area that the wetlands provided and still have @ least a 17 foot wall of water heading toward denser development.

2. Cooks pond which is about 4 acres in size &, has about 25 houses & the waters edge will be flooded, including the houses. Bear in mind the 269 Ac-ft that has yet to be distributed downstream will be upon Cooks pond within 800 more feet.

3. The hazard classification of "high", selected & discussed on page 2, still holds.

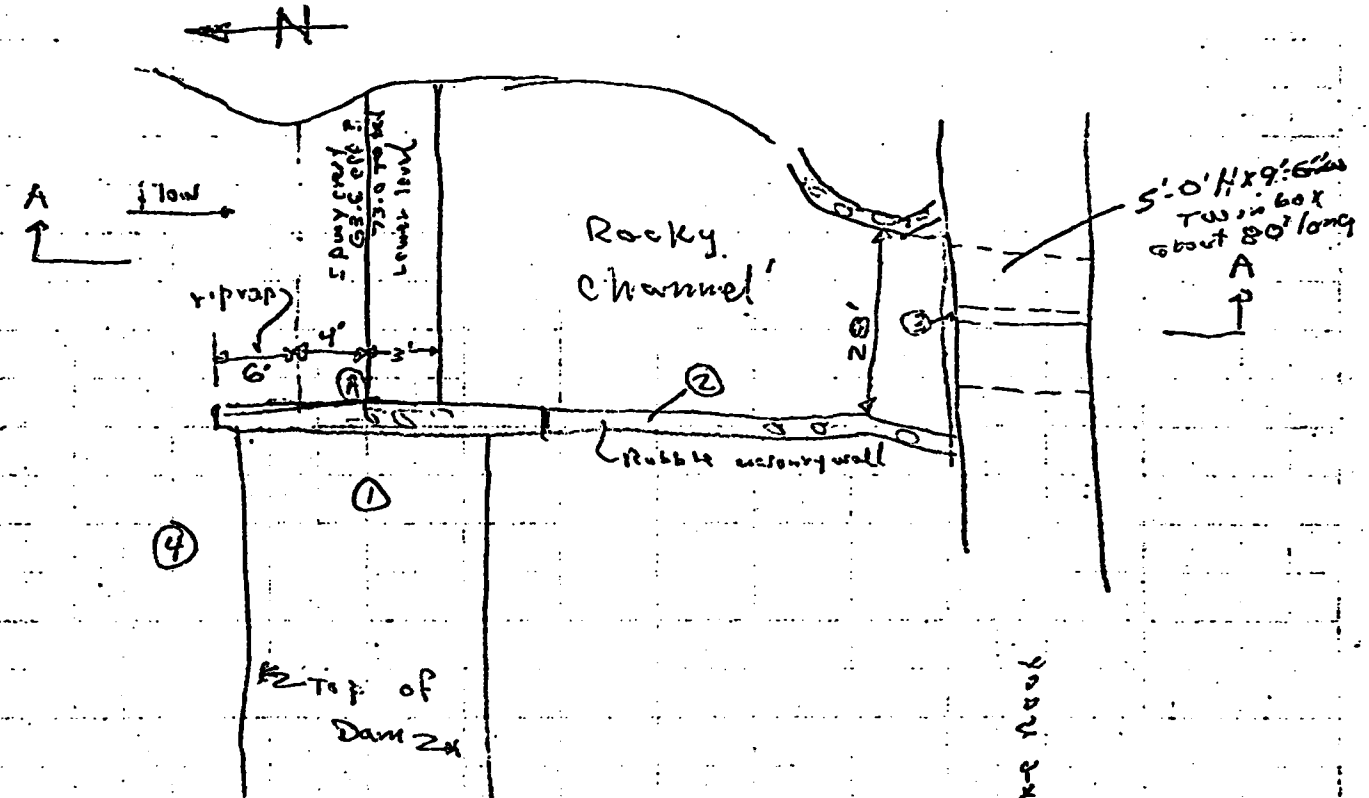
4. A more complete analysis may be desired, under phase II, if further delineation is required

5. The PMF came within 1.7 feet of overtopping the dam.

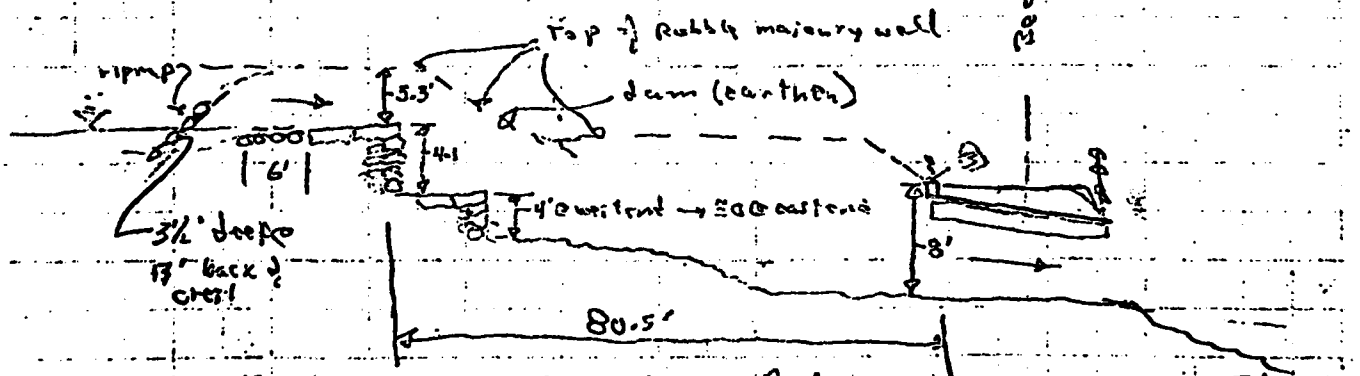
Stratford Conn

Beaver Lake Dam

11/20/78
By DJB
early PM



Plan View
NTS



SECTION A-A
NTS

	FS		Elev
(A)	≈.31	Spillway Crest	173-0
(1)	0.48	Top of Dam	177.83
(2)	4.74	Top of wall	173.57
(3)	10.85	Top of cone metal rail on road over US side of bridge	167.46
(4)	5.24	Water Surface	173.07

Met Friday Maven Caretaker Since 1960

APPENDIX E

INFORMATION AS CONTAINED IN THE INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY | MO | YR
CT	83	NED	CT	001	04				BEAVER DAM LAKE DAM	4114.8	7308.5	11JUL79

POPULAR NAME	NAME OF IMPOUNDMENT
	BEAVER DAM LAKE

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	07	PUMPKIN GROUND BROOK	STRATFORD	0	49775

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUC. HEIGHT (FT.)	HYDRAU. HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REPG	1911	R	47	47	1216	898	NED	N	N	N	N	

REMARKS
1911-RAISED TO PRESENT ELV

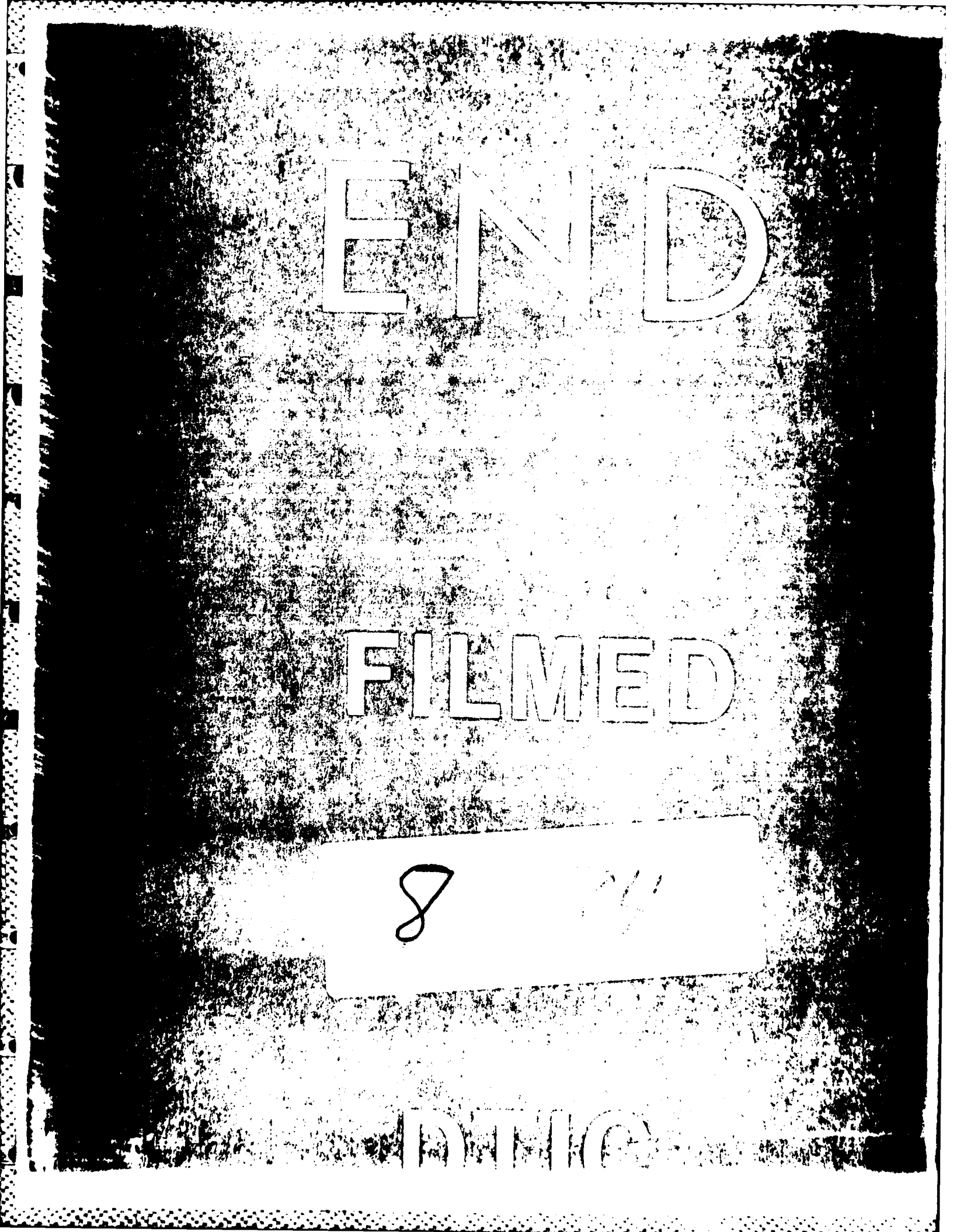
D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	1300	U	73	2300												

OWNER	ENGINEERING BY	CONSTRUCTION BY
BEAVER DAM LAKE ASSOC		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
CT WATER RESOURCES	CT W R	CT W R	CT W R

INSPECTION BY	INSPECTION DATE DAY | MO | YR	AUTHORITY FOR INSPECTION
PHILIP W GENOVESE AND ASSOC	20NOV78	PUBLIC LAW 92-367 8AUG1972

REMARKS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FILMED
8